BREAKTHROUGH! READY-BUILT, LOW-COST HELI

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Perfect Finish

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Hangar 9's 1/3-scale

Sukhoi

Exotic scale soaring

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LEARN FROM THE PROS!

Installing lightweight wheels

Masking and painting

Carving wingtips

RCX

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MODEL Airplane NEWS

NOVEMBER 2002 VOLUME 130, NUMBER 11

ON THE COVER: this ARF aerobat really performs! Read our exclusive first review of Hangar 9's ⅓-scale Sukhoi on page 48. ON THIS PAGE: the WattAge Fokker Eindecker 400 is a great backyard dogfighter; read Roger Post Sr.'s review on page 42 (photos by Pete W. Hall).

FEATURES

CONSTRUCTION

FLIGHT TESTS

COLUMNS

DEPARTMENTS

We've got you covered!

The last thing that you apply to your model—but the first thing people notice—is its **covering**. Hundreds of choices of model-covering materials and products are available, from iron-on plastic films for sport models to dozens of types of glue-on fabrics for scale aircraft. In this issue, senior technical editor Gerry Yarrish details how to achieve a perfect finish every time. With the right tools and techniques, covering your model can be just as enjoyable as building it. Ever wonder whether you can paint a film-covered model? Check out Gerry's article on page 28 and find out!

IN THE WORKSHOP

After you've covered your model, **"Scale Techniques"** columnist Dick van Mourik shows you how to mask it off and paint it for a perfect scale finish. Using his scratch-built Hawker Fury biplane as an example, Dick explains the difference between positive and negative masking techniques, how the height of a mask affects the paint application, and more.

Also in this issue, associate editor Rick Bell shares his method of **carving and shaping wingtip** blocks easily and accurately. You don't need fancy tools or a lot of effort for professional results; see his technique on page 104.

Small-model fans will appreciate Thayer Syme's lightweight method of **installing wheels**, detailed in his article on page 78. Not only does Thayer's technique keep wheels securely fastened to your landing gear, but it also looks neat and clean.

Reed Sherman launches Dave Garwood's Grumman A-6 Intruder, designed in molded styrene by Walter Bub.

In this month's featured construction article, Phillip Kent explains how he built his **Tipsy Junior**—a sport-scale model of a Belgian light plane. The balsa and ply model is built using traditional methods and, because of its simple lines, paint scheme and easy flying characteristics, it is a good choice as a first-time scale subject.

CAJON SUMMIT

Every year, soaring enthusiasts trek to **Cajon Summit** in California's San Bernardino National Forest for some of the best power scale soaring (PSS) in the country. Photojournalist Dave Garwood was on hand to capture the action on film; check out this exciting—and growing—sport and some really impressive scale models on page 36.

GREAT ARF REDESIGN CONTEST

We've really enjoyed seeing all of our readers' creative ways to dress up ARF model airplanes; thank you for your entries! We look forward to showcasing the best **"redesigns"** in the January 2003 issue.

In the meantime, please continue to send us your entries for **"Pilot Projects"** as well as your comments, ideas and suggestions by email to man@airage.com, or to 100 East Ridge, Ridgefield, CT 06877-4606 USA. We always look forward to hearing from you.

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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

P-51 PRIDE

I loved the "Mustang Mania" piece in the October 2002 issue; I knew there were a lot of P-51 models out there but didn't realize how many! I liked the "Best Scale ARFs" article where you picked out your favorites, and I'm interested in knowing which of the P-51 kits you would recommend.

ROBERT SNELLING
Warrensburg, MO

Thanks for the feedback, Robert. With 67 models featured in that article, it would be impossible for us to rank them, even if we had been able to build every one. Your question got us thinking, though, and we've decided to set up an informal survey on our website (modelairplanenews.com) to see which P-51 kits our readers like best. So, all of you Mustang "maniacs" out there, log on and vote for your favorite P-51; we'll publish the results in a future edition of "Airwaves."

DS

UPSIDE-DOWN POWER

I'm new to giant scale and have chosen a Great Planes Ryan STA ARF as my first big airplane. I have an O.S. 1.20 Surpass engine and want to install it inverted. Many of my friends have told me that I am looking for trouble, as 4-strokes don't behave well inverted; they have recommended that I install the engine side-mounted instead. I don't want to cut a big hole in the side of the cowl for this, and besides, the model's scale look would be much better with the engine in the inverted position. Am I really headed for trouble? Is there something that I can do to increase engine reliability? I don't want to look foolish at a giant-scale fly in. Please help. [email]

THOMAS BAXTER

Thomas, don't worry about installing your 4-stroke engine inverted. I have run many brands of 4-strokers—Saito, O.S. Magnum, etc.—and if they're properly broken-in and adjusted, it doesn't matter whether they are inverted or not. Worrying about inverted engine installations is a carryover from 2-stroke engine operation; those engines sometimes bog down during extended low-throttle operation (such as a landing approach). With 4-strokes, it really isn't an issue. To help increase engine reliability, be sure to use a good-quality 4-stroke glow plug; I highly recommend the O.S. F plug. I haven't found a better plug for all-around great engine operation, and it will give you a noticeably improved throttle transition and idle. Also, use a good, 15-percent nitro fuel; I use Wildcat's Premium Xtra. If you really want peace of mind, install an onboard glow-driver system

such as those available from McDaniel. Set it up to turn on at a ¼-throttle setting or lower. It will also make it easier to start your cowled-in engine. For reliable fuel delivery, install your fuel tank so that its centerline is appropriately located relative to the carb; it should be at, or slightly below, the spray bar.

Good luck, and let us know how you liked your first giant-scale fly in! GY

WHAT'S ALL THE X-CITEMENT?

At our last club meeting, the topic of model trade shows popped up. Most of us had attended the Westchester Radio Aero Modelers' (WRAM) show in Westchester, NY, the big Weak Signals RC Expo in Toledo, OH, and the Radio Control Hobby Trade Association (RCHTA) show at the Rosemont Convention Center in Chicago, but what's this we hear about the RCX show? Several of my buddies have seen the advertisements, but no one knows the inside story. What's it all about? [email]

BRAD CUNNINGHAM

Brad, the Radio Control Expo (RCX) show will take place at the Anaheim (CA) Convention Center on May 2, 3 and 4, 2003. Model Airplane News *and its sister publications* Backyard Flyer, RC Boat Modeler, RC Car Action *and* RC Nitro *are teaming up to make this a fun, entertaining and exciting event. The show is a partnership of our publisher, Air Age Inc., and Vision Entertainment. What sets this exposition apart from the rest is that there will be many hands-on demo areas including an outdoor,aircraft flight zone and an indoor racetrack. There will be lots of opportunities to see the RC industry's newest products and to speak with manufacturers and hobby celebrities. There's more information about the RC Expo at rcexpo.com, so check it out. It's going to be a great time! Hope you can make it!* GY

ENGINE QUESTIONS

I read Dave Gierke's article on engine break-in in the November 2001 issue of *Model Airplane News* and decided to use that method to break-in my Rossi 23R40 (2-stroke). Our local hobby shop carries two popular fuels that don't indicate an oil content on the label; one says it's "all synthetic," and the other is a synthetic-castor blend. Can I assume that they have an 18-percent oil content and add enough castor to bring it up to the recommended 20 percent? [email]

FLOYD MAIDMENT

Floyd, you can add some castor oil to these fuels, but how much? Why "assume" anything? Switch to a fuel manufacturer that divulges the percentages of lubricant in its fuels; there are several reputable formulators (Red Max, Wildcat, Sig, etc.) that openly list the fuel's ingredients and percentages on the label. Why take the chance of running too little lubricating oil in your new engine?

DAVE GIERKE

NEW PRODUCTS OR PEOPLE hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. Every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!

AIR SCOOP

by the staff of Model Airplane News

SPORTSMAN AVIATION

SUPER Decathlon

We're told that this 86-inch-wingspan Decathlon is as striking in the air as it is on the ground, but we thought you might like to be the judge. Constructed of lightweight, high-quality balsa and covered in iron-on covering, the Super Decathlon comes with a hand-laid fiberglass cowl and wheel pants, custom-made aluminum landing gear, clear molded windows and a complete fairing and decal set. It requires a 1.20 to 1.80 2-stroke or 4-stroke engine and a 4-channel radio with five servos. It sells for $300.

Sportsman Aviation; distributed by Global Hobby Distributors (714) 963-0133; globalhobby.com.

MEGATECH

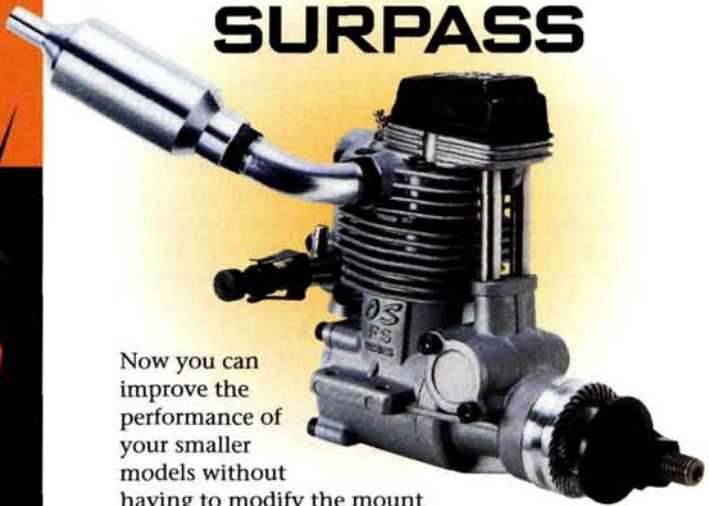
P-51 MUSTANG

For most modelers, the urge to own a Mustang is virtually irresistible, and this new ready-to-fly P-51 from Megatech just may put some over the edge. The 32-inch-wingspan park flyer comes fully assembled and can be in the air in a matter of minutes. It features a rugged, Poly Nylonlene fuselage with an Air Force finish that requires no painting, an under-cambered airfoil wing and stall-resistant reflex tips for excellent slow-flight characteristics. This ready-to-fly scale classic also comes fully equipped with a Speed 400 motor with gear reduction drive, a 3-channel radio and a 7-cell, 600mAh onboard rechargeable battery. It sells for $229.99.

Megatech (201) 662-2800; megatech.com.

O.S. ENGINES

FS-30S SURPASS



Now you can improve the performance of your smaller models without having to modify the mount for a larger engine. The new FS-30S produces more torque than the FS-26 but easily fits into the same mounting applications. The FS-30S comes with a muffler and features the same helix gear-driven camshaft and dependable updraft carburetor as other Surpass engines. It weighs 9.8 ounces and has a displacement of 4.89cc. The factory rates it at 0.5hp at 10,000rpm. The new FS-30S sells for $169.99.

O.S. Engines; distributed by Great Planes Model Distributors (800) 637-7660; osengines.com.

HOBBY LOBBY

Backyard **Zero** & **Messerschmitt Bf 109**

If you're looking for a few new WW II warbirds to beef up your backyard combat collection, here are Hobby Lobby's new Zero and Messerschmitt Bf 109. That's right—one-stop shopping! The almost-ready-to-cover, 43½-inch-wingspan Zero comes with a white gelcoated fiberglass fuselage, balsa-sheeted foam wings and built-up balsa tailpieces. The kit includes a black fiberglass cowl, landing gear, light foam wheels and a complete hardware package. The Zero was designed for brushless motors and sells for $139.

Scale enthusiasts will love this highly detailed Messerschmitt Bf 109 ARF. The 29½-inch-wingspan model comes built and painted with a light foam fuselage, wings and tail. The scale accessories package includes painted radiators, scoops, blisters and air filters made of vacuum-formed plastic. In addition, the ailerons, torque rod and elevator pushrod sheath are all factory installed. Powered by a Speed 280 motor and gearbox turning a 3-blade prop (included), the Messerschmitt Bf 109 sells for $119.

Hobby Lobby Intl. (615) 373-1444; hobby-lobby.com.

TEAM ORION

MICRO **MOTORS**

Team Orion has been a fixture on the RC car market for years. Now the folks there are ready to expand their horizons (so to speak). Orion's new micro heli and airplane motors—Chopper and Air Force (respectively)—are sure to make a splash on the park-flyer scene. These highly efficient motors each turn 17,820rpm at 6 volts and a whopping 21,384rpm at 7.2 volts. Each motor weighs 42 grams, is 28.9mm long and has a diameter of 21mm. The price for each is $69.99.

Team Orion (714) 694 2812; team-orion.com.

NORTHEAST SAILPLANE

Vermont Belle

There really couldn't be a more appropriate name for this adorable little aerobat. The 41-inch-wingspan Vermont Belle comes completely built up and covered and weighs between 21 and 25 ounces ready to fly. It requires a 4-channel radio for aileron, rudder, elevator and throttle control and a Speed 480 motor with gear drive for power. The Vermont Belle sells for $129.95.

Northeast Sailplane Products (802) 655-7700; nesail.com.

CANTERBURY SAILPLANES

F20 TIGERSHARK

Canterbury Sailplanes' popular line of EPP slope soarers continues to grow with the addition of this 32-inch-wingspan Tigershark. It is the last of four prototypes—the result of eight months of flight-testing. It features a Joe Wurts-designed airfoil, and all of the EPP parts come computer-cut for accuracy. The Tigershark comes with Correx tailplanes and fiberglass spars, plus all of the necessary hardware and filament reinforcing and covering tape. In addition, the locations for the servos, receiver and battery come factory-cut to ease assembly and get you in the air as quickly as possible. The Tigershark requires only a 2-channel radio and sells for $65.

Canterbury Sailplanes; canterburysailplanes.co.nz.

ASTROFLIGHT

110 DX Charger

The AstroFlight 110D is one of the most popular chargers on the market, and that bodes well for the new and improved 110 DX that will soon replace it. This new version can charge 1 to 24 cells at from 50mAh to 8 amps and can discharge the same number of cells at up to a 1A load. As with the 110D, an LCD screen on the 110 DX displays multiple readouts, but unlike the 110D, a single knob controls any changes in charge or load current setting. That's right—no more menu confusion. The new 110 DX will sell for $129.95.

AstroFlight (310) 821-6242; astroflight.com.

CACTUS AVIATION

Extra 330S

If the exceptional flight characteristics of the Cactus Extra 330S weren't enough to grab your attention, this new airbrushed finish certainly will. The striking desert scene is airbrushed by hand onto this special-edition Extra. In addition to the incredible finish, this model comes pre-hinged and with the wing incidence already dialed in. The canopy and canopy frame come attached, and the tailwheel, wheel pants, tires and carbon-fiber motor dome were all factory-installed. Cactus recommends that you power this 118-inch-wingspan Extra with a 3W 150i B2 engine. It sells for $3,795.

Cactus Aviation (520) 721-0087; cactusaviation.com.

SUPER FLYING MODELS

Eindecker 40 ARF

With the introduction of this new Eindecker 40 ARF, Super Flying Models adds its name to the growing list of manufacturers with an obvious affinity for this famous WW I warbird. This easy-to-assemble trainer can be mission ready in just a few short evenings and features top-quality balsa construction, a striking WW I trim scheme and a painted fiberglass cowl. The Eindecker also comes with all of the necessary hardware and sells for $109.99.

Super Flying Models; distributed by Horizon Hobby Inc. (217) 355-9511; horizonhobby.com.

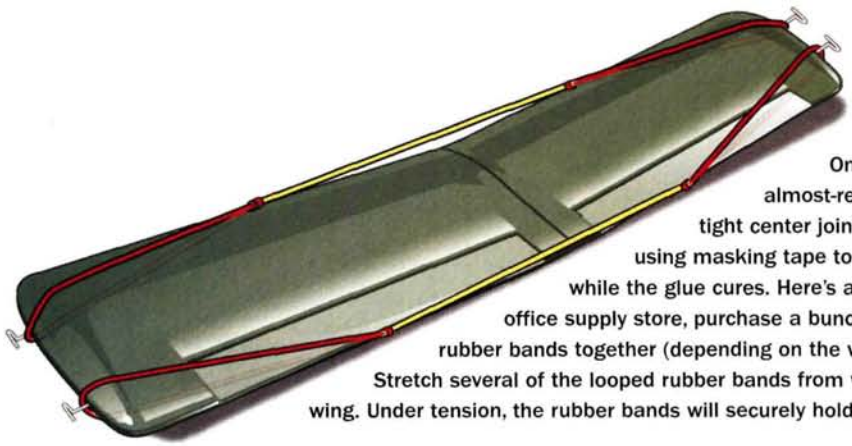
GTM INC.

GERMAN WW I LOZENGE FABRIC

Looking to give your new ¼-scale WW I fighter a special finish? Look no further than GTM Inc.'s new ¼-scale, four-color lozenge fabric. This 100-percent dyed-linen fabric is the result of 18 months of research and development. It can be easily applied with standard nitrate and butyrate dope. The lozenge fabric comes in both light and dark shades, and the 16x60-inch panels sell for $16 each.

GTM Inc. (919) 643-1001; gtmodels.com.

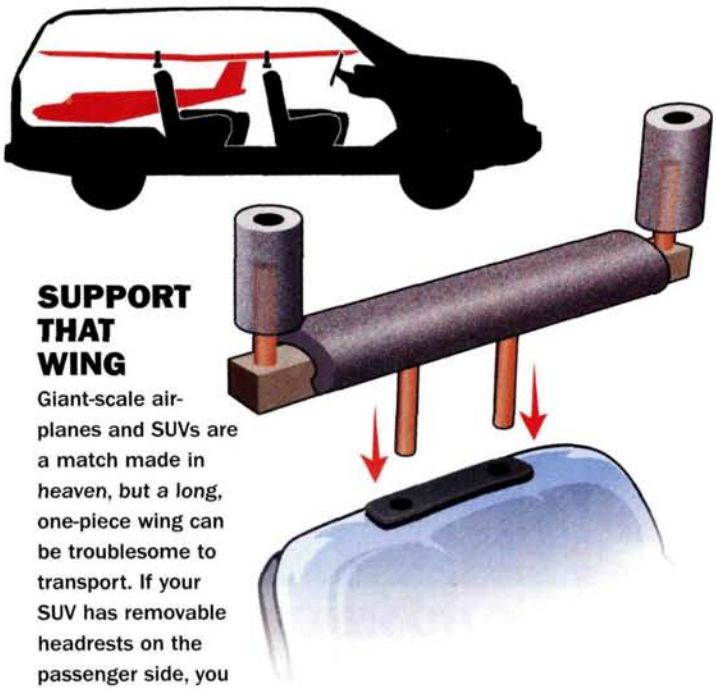
SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.



STRETCHED TO THE LIMIT

One of the more challenging tasks when you assemble an almost-ready-to-fly kit is joining the wing halves. They require a tight center joint for maximum strength. Most manufacturers suggest using masking tape to hold things together, but often the tape will pop off while the glue cures. Here's a better way that can be used on any size wing. At an office supply store, purchase a bunch of 7-inch-long rubber bands. Loop two or three of the rubber bands together (depending on the wingspan) and then stick some pins into the wingtips. Stretch several of the looped rubber bands from wingtip to wingtip on both the top and bottom of the wing. Under tension, the rubber bands will securely hold the wing halves together.

Michael Tevis, Royersford, PA



SUPPORT THAT WING

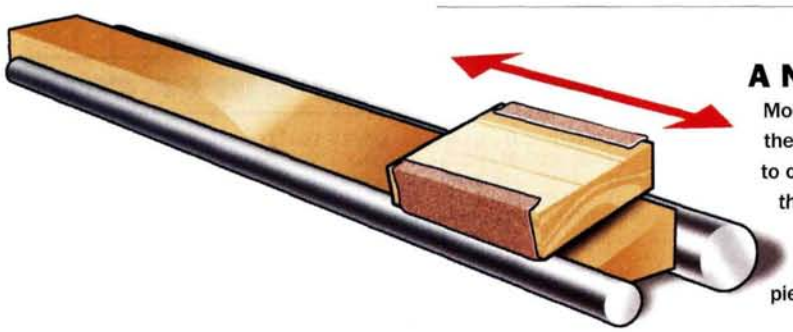
Giant-scale airplanes and SUVs are a match made in heaven, but a long, one-piece wing can be troublesome to transport. If your SUV has removable headrests on the passenger side, you can custom-make a cradle for that wing. Size it to match the wing's chord, and it will securely hold the wing and prevent it from moving around. Make the cradle as shown, or use different materials if desired.

Carlos Fondren, Shelter Cove, CA

HANDY PARTS HOLDER

Many companies hand out magnetic business cards. Collect several and tape them together to make a handy magnetic "tray." Place the tray under your aircraft, and if you drop small screws or other metal parts, the tray will catch them. Sure beats looking for small parts that all but disappear in grass. Also, use the tray on your workbench to hold small parts when you assemble your model.

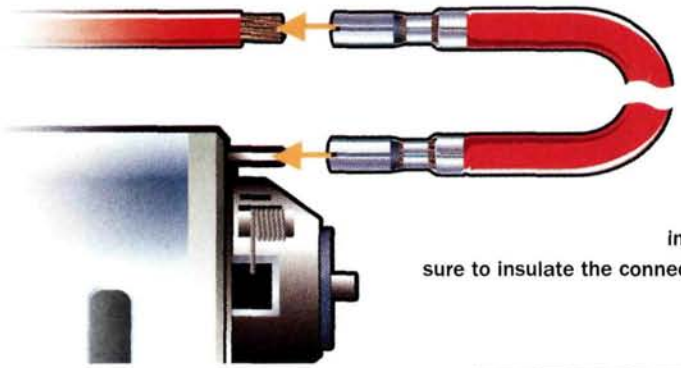
Thomas Messing, Buffalo, NY



A NEW ANGLE ON SANDING

Modelers like to make parts such as trailing edges from sticks of balsa, as they can select exactly the grade of wood needed. Here's an easy method to carve and sand a long stick down to a uniform taper. Obtain two rods that have the diameter of the taper required, and pin them on either side of the balsa stick. Now carve and sand the top side of the balsa until the sandpaper meets the rods. When finished, you'll have a piece of tapered balsa that's uniform for its entire length.

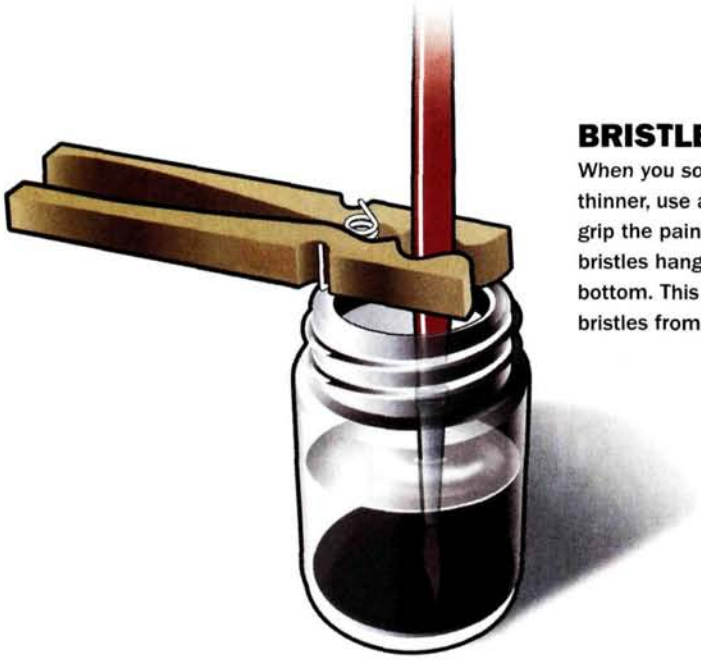
James Talvy, Staten Island, NY



MOTOR-SOLDERING ALTERNATIVE

Beginners who are not yet skilled at soldering can pick up a set of automotive connectors, crimp them onto the leads coming from the ESC, then slide the connector onto the soldering tabs on the motor. There is no need for an inline connection, and now switching motors is a breeze. Be sure to insulate the connectors on the ESC so they will not short out if they touch.

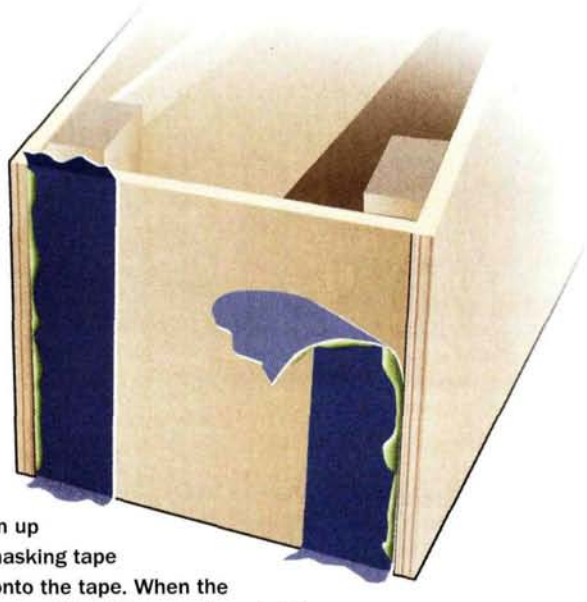
Mike Hardisky, Nicholson, PA



BRISTLE BUDDY

When you soak brushes in thinner, use a clothespin to grip the paintbrush so the bristles hang clear of the bottom. This will prevent the bristles from bending.

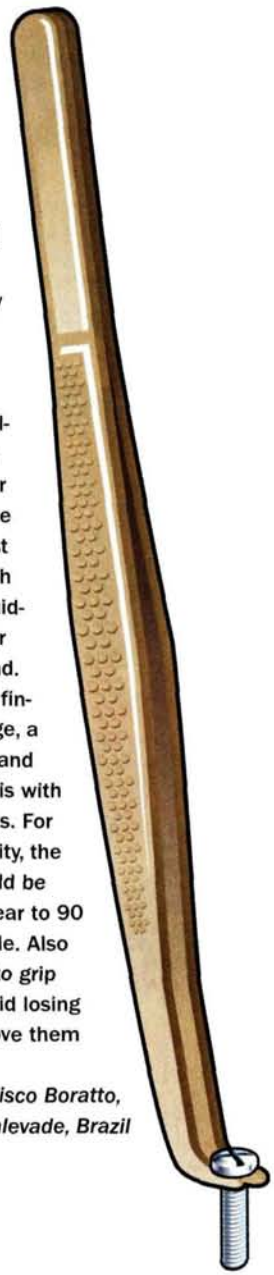
Greg Bond
Waterford, NJ



EASY EPOXY CLEANUP

To get a strong joint at a firewall, or to join wing halves, you must use plenty of epoxy, and that means it will ooze out of the joint and make a gooey mess. Instead of using alcohol and paper towels to clean up the epoxy before it cures, stick masking tape along the joint so the glue runs onto the tape. When the glue starts to set, pull off the tape, and it will leave a clean joint.

Randy Ryman, Harrisonburg, VA



A HELPING HAND

If you build and fly small airplanes, affixing small screws in tight places can be challenging. Installing servos in a slender fuselage is just one example. You must hold the screw with one hand while guiding the screwdriver with the other hand. Instead of clumsy fingers in the fuselage, a great way to hold and guide small parts is with curved-tip tweezers. For maximum versatility, the tweezers' tip should be rounded and as near to 90 degrees as possible. Also use the tweezers to grip small parts to avoid losing them as you remove them from tight spots.

Francisco Boratto,
Monlevade, Brazil

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Chuck Vettes,
Rancho Cucamonga, CA
MARUTAKA P-38

Nothing grabs attention at a flying field like the sound of a twin-engine warbird, and we're sure that Chuck's Lockheed P-38 Lightning gets a lot of it. Built from a Marutaka kit, it took Chuck 11 months of carving balsa and fiberglassing to complete the 13-pound fighter. He painted the model with water-base latex paint and clearcoated it with water-base satin to fuel-proof the finish. The two inverted O.S. .61 4-strokes have onboard glow for a low reliable idle, and Chuck uses a Futaba Super 8 transmitter with eight Hitec servos and a Hitec receiver to fly the model. According to Chuck, the P-38 flies like a dream and sounds great.

P. W. J. Smith,
Worthing, Sussex, England
ME 262 STORMBIRD

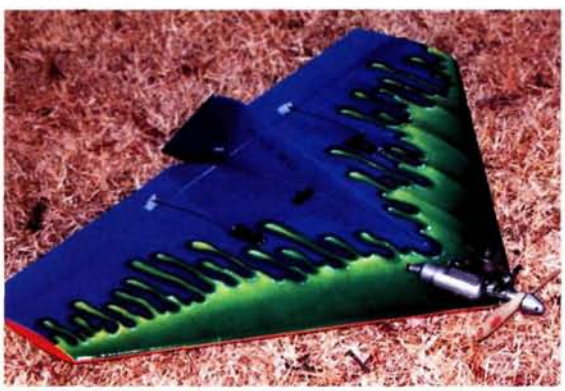
After building and flying Mark Rittinger's Me 262 that was published in the October 2001 issue of *Model Airplane News*, P. W. decided to scale up the German jet to a wingspan of 48 inches. Twin Graupner 600 7.2V Eco motors that turn 9x5 Cam folding props power the Stormbird. The 3-channel model uses a single servo for elevator control, and P.W. installed two microservos for the ailerons in the outboard faces of the nacelles. Although he hasn't flown the model yet, P. W. is confident the plane will fly as well as the smaller version.

Charles Barsony,
Brantford, Ontario, Canada
ULTIMATE BIPLANE

Charles writes that he really enjoys wringing out his Direct Connection Ultimate Bipe. The model is powered by an YS 1.20 FZ that turns an APC 16x8 prop. He used Solartex with a K&B epoxy finish on the fuselage and covered the wings and tail with UltraCote. Charles notes that the white and orange colors really stand out while flying.

Bill Vautrain, Sugar Land, TX
HEINKEL P.1076

Bill tells us he used a 3-view from a book to design and build this unique high-altitude Luftwaffe fighter design. The wing spans 62 inches and has an 8-degree negative sweep. The 7-pound model is powered by a SuperTigre .45, and Bill says it's very stable in flight and easy to fly. He also notes that for some reason Heinkel never built a full-scale plane of this design.

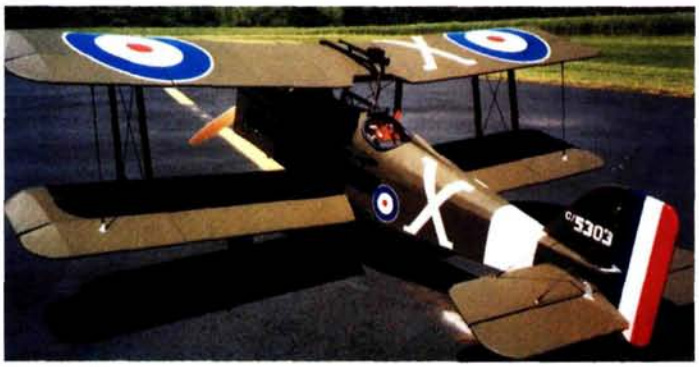


Stan McDaniel,
Little Rock, AR
WILD WIZ 40

While attending a SMALL event, Stan spied this neat little delta wing that was for sale and bought it. Power is provided by an O.S. .32, and the model is covered with MonoKote. Stan decided to dress the plane up a little and used an airbrush to apply the wild paint scheme. We bet the little delta flies as wild as it looks.

Ed Van Bernum, Bluffton, SC
SUPER SKYBOLT
Ed's model is built from a Great Planes kit and has an O.S. 1.20 Surpass 4-stroke engine that swings a 14x10 Master Airscrew prop. Covered with 21st Century fabric, the sleek bipe, according to Ed, is excellent at performing aerobatics and also has great low-speed characteristics. Ed has been flying RC for 40 years and reports that the Skybolt is "the best-flying plane I've ever had."

M. Patrick Murphy, Sussex, WI
FLYING KING
Patrick's favorite model is his Bruce Tharpe Engineering Flying King. Powered by a Saito .80 4-stroke and guided by a Futaba T6XA radio and servos, the big plane, according to Patrick, is the most relaxing model he has flown. When he built the kit, he added flaps to the wing and covered the model with Coverite 21st Century fabric. Patrick informs us that the plane's wide track and large wheels are ideal for flying off grass fields.



Carl Schurenberg, West Chester, OH
FUN AERO SE5A
WW I warbirds are always popular among modelers and this fine SE5a is no exception. The 22-pound biplane is covered with Solartex for a realistic fabric finish and is powered by a Zenoah G-38 gas engine. The model spans 80 inches and Carl added scale details such as an instrument panel, wing rigging and a mounting step. For the utmost in realism, Carl duplicated the markings of aircraft C/5303 (X) flown by Lt. Franklin of the 56 Squadron during WW I.

Ray Shroba, Minooka, IL
GIANT STINGER

Ray built his giant-scale Stinger from the popular Lanier kit and powers it with a Zenoah G-62. When Ray built the fuselage, he decided to use 1/32-inch birch plywood for the turtledeck, tank cover and wing cover/cockpit instead of the supplied plastic parts. The colorful 22-pound model is covered with MonoKote and UltraCote and uses a GI Joe in the cockpit. Ray guides the Stinger with a Hitec Prism 7 radio, and he says the plane flies great!

Jerry Schmid, Saline, MI
SIG FOUR-STAR 40

Patrolling the skies over the Michigan Radio Control Association club field is Jerry's Sig Four-Star 40. He modified the plane to include a cowl instead of the open-nose configuration, enlarged the tail feathers and added wheel pants. He covered the model with Top Flite MonoKote and used matching LustreKote paint on the fiberglass parts. Jerry writes that the Four Star flies great. We're sure his fellow club members feel secure knowing Jerry is patrolling overhead.

we've got you a complete guide

by Gerry Yarrish

Once you decide to build all-wood airplanes, you need to apply a finish over the built-up airframe. You can choose from a large array of materials. The two main types are iron-on plastic films and fabric-covering material. Plastic film covering comes with heat-activated glue applied to its underside, while fabric-covering material is available with or without the glue applied. Fabric covering is also available with and without color applied to its outer surface.

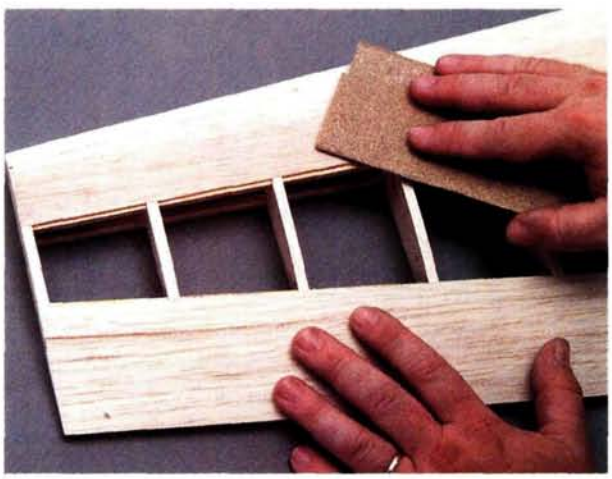
Covering a model airplane isn't as difficult as you may think. With the correct technique and the proper tools, you'll soon have a model to be proud of.

This guide covers the various materials and the basic techniques used to cover a model. Whether you want a scale, paint-over-fabric finish or a shiny, iron-on plastic film covering, the first step is always to prepare the basic wooden structure. No finishing technique will cover up poor building practices.

PREPARATION

To obtain a smooth finish, you need a smooth base. It is always better to have an average-looking finish applied over a superior base structure than it is to have a superior finish over a badly prepared base. Are there any rough spots on your model? Close your eyes and feel its surface with your fingertips. How about raised seams between balsa sheets? Dents and dings must be filled and sanded smooth. The biggest difference between good-looking models and great ones is sandpaper. Start by sanding the entire model with 150-grit sandpaper, and use a tack cloth to wipe away the dust. Sand any raised edges until they are flush, and remove obvious rough spots. Use model filler to fill voids, seams and dents. To help the filler material bond to the wood, moisten the surface lightly with

To make sanding your model easier, start with coarse-grit paper, and then switch to a finer grit. I use aliphatic resin glue, such as Sig Mfg.'s Sig-Bond, to glue balsa sheets and blocks together because it sands easily and doesn't leave any hard ridges or edges. Also, to improve the model's surface, I use model filler to fill in dents and voids between balsa sheets.



The secret to a great-looking covering job is sandpaper! It's important to sand your model as smooth as possible. Take your time and get it really smooth.

covered!

to the perfect finish

warm water. After the filler has dried, sand with 150-grit sandpaper, and use that tack cloth. Now repeat the process with 220-grit followed by 320-grit sandpaper. Apply additional filler if necessary, and wipe the model once more with your tack cloth. (You can't wipe a model with a tack cloth too often!)

At this point, you can start covering the model, or you can apply a coat of Balsarite wood prep from Coverite. Balsarite seals the balsa surface and reduces the number of wrinkles that form after the model has been covered. Allow the sealer to soak into the wood, and let it dry completely before you sand it with 320-grit sandpaper.

APPLICATION

Covering material typically comes in 6-foot-long rolls, but some are available in longer lengths; this is helpful for big- and giant-scale models. For the average .40-size model, you'll need about 1½ 6-foot rolls. Always read the instructions, regardless of the type or brand of covering you use, be it Nelson Lite Film, Top Flite MonoKote, Hangar 9 UltraCote, Coverite's 21st Century fabric, Balsa USA's Solartex, or Sig Mfg. Koverall.

Though various covering materials may look the same, the temperatures at which they must be

There are many brands of covering film. Each has its own "personality," but for best results, read the directions before you apply the covering to your model.

TOOLS FOR THE JOB

No matter which covering material you use, you'll need only a few tools to do the job. Get yourself a good-quality covering iron and a covering-iron thermometer to check its temperature. A yardstick or metal straightedge will help you produce long, straight cuts, and a hobby knife with lots of extra blades is invaluable. You can also use a heat gun to shrink the covering, but it isn't required. Remember: most, if not all, of the wrinkles can be removed by pulling on the material as you iron it down. From gloves and film grippers to cutting guides and wood perforators, lots of useful tools are available to make your job easier. A clean, flat work surface and some foam padding will also help keep hangar rash to a minimum while you move your model around. You worked so hard to make your model as smooth as possible; let's try to keep it that way!

The most basic tools for covering model airplanes are a good old hobby knife with lots of sharp blades and a long straightedge to guide you as you cut the covering to size.

If you use iron-on covering, you have to have an iron! Several brands of covering irons are available. The standard large iron, with its sloping tip, can handle most covering jobs, but the smaller trim irons with their various tips can really help you out in tight spots. An iron thermometer is a must if you want to accurately adjust your iron's temperature.

FABRIC COVERING

Fabric covering is a bit easier to apply than plastic film; it conforms very easily to curved shapes. Iron-on fabric is available with prepainted finishes or with dyed-in color. You can also buy it with an unfinished surface to which you can apply your own color coat. Though more convenient to use, iron-on fabrics produce a slightly heavier finish because adhesive has been applied to all of the fabric. Glued-on fabric weighs less because glue is used only where the fabric touches the airframe.

You can glue the fabric onto your model using the dry or wet method. With the dry method, you apply one or two coats of adhesive to the airframe and let it dry. You then drape the fabric over the structure and brush a solvent onto the fabric that covers the glue-coated areas. The solvent soaks through the fabric and activates the glue as you press the fabric into place.

Covering doesn't always come on a roll. Coverite's CoverLite (blue) and F&M Enterprises' Stits Lite fabric come in flat-folded, blanket form. The CoverLite is iron-on; the Stits Lite is a glued-on covering.

With the wet method, you drape the fabric over the structure and then lift the edges out of the way. You then brush the glue into place and quickly press the fabric back into position. After the glue has dried, you move on to the next section and repeat the process, brushing on the glue and pressing the material into place several inches at a time. The wet glue method takes a little longer than the dry method and is a little messier, but it produces a very strong bond between the fabric and the underlying structure.

To help iron-on covering stay put, a balsa conditioner such as Coverite's Balsarite should be applied to the model's surfaces. Covering adhesives, such as Sig Mfg.'s Stix-It and F&M Enterprises Poly Tak, are used with glue-on fabrics.

Fabric coverings come in a variety of types, colors and sizes. Here you can see how they differ. From left to right: antique-colored Super Coverite, Nelson LiteFab, 21st Century painted fabric and Arizona Model Aircrafters' lozenge-printed fabric. All of these coverings are iron-on.

PAINTING FABRIC

After a fabric covering is shrunk into place, it has to be sealed before you paint it. Some modelers use a coat or two of nitrate dope, but I prefer to use Stits Lite Poly Brush sealer. Again, you should follow the instructions when using a new material. First clean the fabric with a wipe of fast-drying solvent such as MEK or acetone. Wear protective latex rubber gloves when using strong solvents, and work in a well-ventilated area. Wipe the surface with a tack cloth, and brush on the first coat of sealer. Let the sealer dry for a few minutes and then brush on a second coat applied a 90-degree angle across the first coat. This is usually sufficient to seal the weave, but if you want a really smooth finish, you can spray on a third coat. Once the sealer coat has dried, you can apply your favorite paint. Make sure that all your finishing materials—primers, paints, sealers and clear coats—are compatible before you apply them to your model.

Apply just enough paint to give an even coverage, and avoid heavy coats that may run; it is difficult to sand blemishes on a painted-fabric surface. There are many paints and finishing products on the market, and it would take an entire article to properly cover all the painting techniques involved. Take your time, and follow the instructions that come with the products you want to use.

Always use a tack cloth to wipe away dust before you cover your model. It will make a big difference.

applied often differ. Some materials require a lower temperature for tacking and sealing and a higher temperature for shrinking.

Some covering materials come with a clear backing sheet that protects the heat-activated glue and prevents it from sticking when it's rolled up. Don't remove the backing until you are ready to apply the material to your model. To use the material efficiently and minimize waste, cover all the large surfaces first; then, using the left-over material, cover all the smaller parts. The largest surface is the wing, so let's start there.

THE WINGS

It is easiest to deal with the dihedral of a wing by covering it in four pieces; two pieces for the bottom surfaces and two for the top ones. The seam left in the center of the wing can easily be covered with

trim or simply left as is. Roll out enough material to cover the bottom of one wing panel, and leave 1-inch overhang all around. This makes it easy to hold and to pull the material when you tack it into place. Now set the covering iron to the recommended temperature and let it heat up.

Wipe the wing down with a tack cloth and remove the protective backing from the covering material. Drape the material over the wing, and smooth it out. Using the covering iron, lightly tack the edges of the material into place, and gently pull out any wrinkles as you go. Use a crisscrossing pattern to tack each of the corners into place and to go around the edges. Each time you tack the material down, gently pull the wrinkles out and smooth the covering. If any of the tacked areas pop up, simply pull the material tight and reattach it with the iron. The edges should be completely sealed before you shrink the covering tight. Starting in the center of the panel, lightly run the iron over the covering until it tightens. Check for any remaining wrinkles, and apply heat to remove them. That's it! Now, do the same to the other bottom surface.

After the bottom surfaces have been covered, use the same technique to cover each wing's upper surface. The top is curved more than the bottom, and this makes it a little more difficult to remove all the wrinkles. Work slowly, and keep pulling the wrinkles out as you go. Once the wing is completely covered, run the iron over each of the ribs to bond the covering to the capstrips.

Other specialty tools include the Top Flite Woodpecker, which perforates the wood before you cover it. These covering grippers (top) from Eureka Hobbies, called the "Cool Tool," make it very easy to grip and pull on the edges of the covering as you tack it into place.

THE FUSELAGE

To simplify the task, cover each of the four fuselage sides (the top, bottom, left and right sides) with individual pieces of covering. To minimize the visibility of the seams, cover the bottom first, then the two sides. Cover the top last. Also, if you are going to use different colors on the sides, apply the covering from the bottom up and from the tail forward toward the nose. This will make the overlapped seams face down and back; it's more difficult for exhaust residue to get under the seams this way.

As with the wing, start by tacking down the corners and then work with small sections of the edges. Force any bubbles of trapped air out toward the edges before you completely seal them. To let the air escape from really stubborn bubbles that won't move, carefully poke them with a razor knife; then reseal the covering. To prevent the edges from lifting later, overlap the corner seams by about ¼ inch.

Cover all of the tail parts in the same manner. Tack the material into place and work around the edges until it is all sealed down. Run the iron over the surfaces until all the wrinkles are gone, and shrink the material tight.

TRIM COLOR

Trim colors can be applied with either stick-on decals, sheets of stick-on trim material, or pieces of iron-on material. Cut the trim to shape and apply it to the model; be sure to remove any dust from under the trim piece. To minimize bubbles when applying iron-on material, first cut the piece to size and place it in position. Mark its position on the model and then remove the covering from under the trim area. Cut away the underlying material and leave it about ¼ inch smaller all around so the trim overlaps the edges. Tack the trim into place and seal all the edges. For large trim-color areas, remove

PAINTING FILM

Contrary to popular belief, it is possible to apply paint over iron-on films. You do, however, have to prepare the surface for the paint to stick properly. Thoroughly clean the surface using a good degreaser or a solvent that evaporates quickly; then use a very fine scrub pad to lightly scuff the surface. Wipe the surface with a tack cloth and apply the lighter colors first, followed by the darker ones. Apply very thin, mist coats and build up the coats, until you have just enough paint for even coverage. Let the paint dry completely before you mask it off for trim colors; use low-tack automotive masking tape. After applying trim and decals, apply a light clear coat to seal the edges.

To produce matte or satin finishes, cover the model with film and then mist a flat clear coat over the entire model; this works especially well on electric-powered models when saving weight is important. Apply the clear coat after you've applied the decals, and it will look as though you spent dozens of hours painting your model. Test your paints and clear coats on any decals before applying them to your model.

Who says you can't paint over iron-on plastic finishes? Here, Rick Bell's Great Planes Tiger Moth ARF was completely transformed with a few coats of LustreKote paint. Thoroughly clean the model's surface before you spray on the paint and apply the decals, then add a clear coat to seal everything down. Make sure the paint is completely dry before you apply masking tape.

MANUFACTURER	COVERING	TYPE	PRICE
ARIZONA MODEL AIRCRAFTERS	Lozenge Camouflage	Iron-on printed fabric (available in 3-, 4- and 5-color patterns; three-scale sizes)	$12 to $14 per ft.
BALSA USA	Aero Span	Iron-on low-temperature film	$7.99
	Solartex	Iron-on colored fabric	$13.99
COVERITE	Super Coverite	Iron-on unpainted fabric	$12.99 to $13.99*
	21st Century Fabric	Iron-on painted fabric	$21.99
	21st Century Film	Iron-on film	$14.79 to $17.49*
	CoverLite	Iron-on synthetic tissue (19½x36-in. sheet)	$4.99
	Micafilm	Glue-on ultralight non-woven fiber	$7.99 to $11.99*
	Black Baron Film	Iron-on film	$11.99
F&M ENTERPRISES	Stits Lite	Glue-on unpainted fabric (60 in. wide)	$6.95 per linear yd.
GLENN TORRANCE MODELS	Lozenge Camouflage	Glue-on dyed linen, non-shrink (4-color, light or dark) 16x60 in.	$16
HANGAR 9	Ultracote	Iron-on film	$19.29 to $28.49*
	Ultracote Lite	Iron-on lightweight film	$19.29
HOBBY LOBBY	Oracover	Iron-on low-temperature film	$9.99
	Lite Span	Glue-on lightweight polyester fiber	
		(36x20 in.)	$3.70
		(72x20 in. white)	$7.50
	Superkote	Iron-on low temperature film	$7.70
	Superfabric	Iron-on colored fabric	$16.90
HORIZON HOBBY	EasyCoat ™	Iron-on film	$13.29
	Solar Film	Iron-on film	$12.95 to $14.95*
	World Tex	Iron-on colored fabric	$19.95 to $24.95*
NELSON HOBBY SPECIALTIES	Nelson LiteFILM	Iron-on lightweight film	$10.95
	Nelson LiteFab	Iron-on unpainted polyester fabric	$16.95
	Nelson ColorFab	Iron-on painted polyester fabric	$16.95
	Nelson RC Fabric	Glue-on unpainted fabric (63 in. x 4 yds.)	$25
SIG MFG.	Koverall	Glue-on unpainted fabric (48 in. wide)	$4.45 to $16.50
TOP FLITE	MonoKote	Iron-on film	$11.99 to $18.99*
	EconoKote	Iron-on low-temperature film	$8.99
TOWER HOBBIES	TowerKote	Iron-on film	$9.99

Most prices are based on typical 26- to 27-inch width and a 6-foot length. Check with manufacturer for prices and availability of longer rolls.
*Price range covers differences in covering type: glossy, flat, metallic, silver, or transparent.

It's always a good idea to protect your hands while you cover your model. I use latex rubber gloves whenever I apply balsa conditioners, solvents and fabric glue. Top Flite sells these gloves and mitts to protect your hands. The gloves have grippy dots to help you pull the covering tight; they also protect your fingers from the hot iron. The mitt is worn while you press the heated covering down onto the airframe.

the underlying material along a straightedge that is supported by a solid surface. The area between the leading edge of the wing and the main spar is a good example of where you need to do this. For wingtips of different colors, remove the covering back to a rib and recover the entire portion of the wing with the new color. Avoid making seams over open areas of the wing.

Covering and finishing models is not as difficult as it seems; just follow the instructions, prepare the underlying surfaces and take your time through the final stages. You'll be rewarded with a beautiful finish that will last indefinitely. ✈

Arizona Model Aircrafters *(480) 348-3733; arizonamodels.com.*
Balsa USA *(800) 225-7287; balsausa.com.*
Coverite; *distributed by Great Planes.*
Eureka Hobbies *(405) 239-6288.*
F&M Enterprises *(714) 583-1455.*
Glenn Torrance Models *(919) 643-1001; gtmodels.com.*
Great Planes Model Distributors *(800) 637-7660; greatplanes.com.*
Hangar 9; *distributed by Horizon Hobby.*
Hobby Lobby *(615) 373-1444; hobby-lobby.com.*
Horizon Hobby *(217) 352-1913; horizonhobby.com.*
LustreKote; *distributed by Great Planes.*
Nelson Hobby Specialties *(877) 263-5766; nelsonhobby.com.*
Sig Mfg. *(800) 247-5008; sigmfg.com.*
Stits Lite; *distributed by F & M Enterprises (817) 279-8045; stits.com.*
Top Flite; *distributed by Great Planes; top-flite.com.*

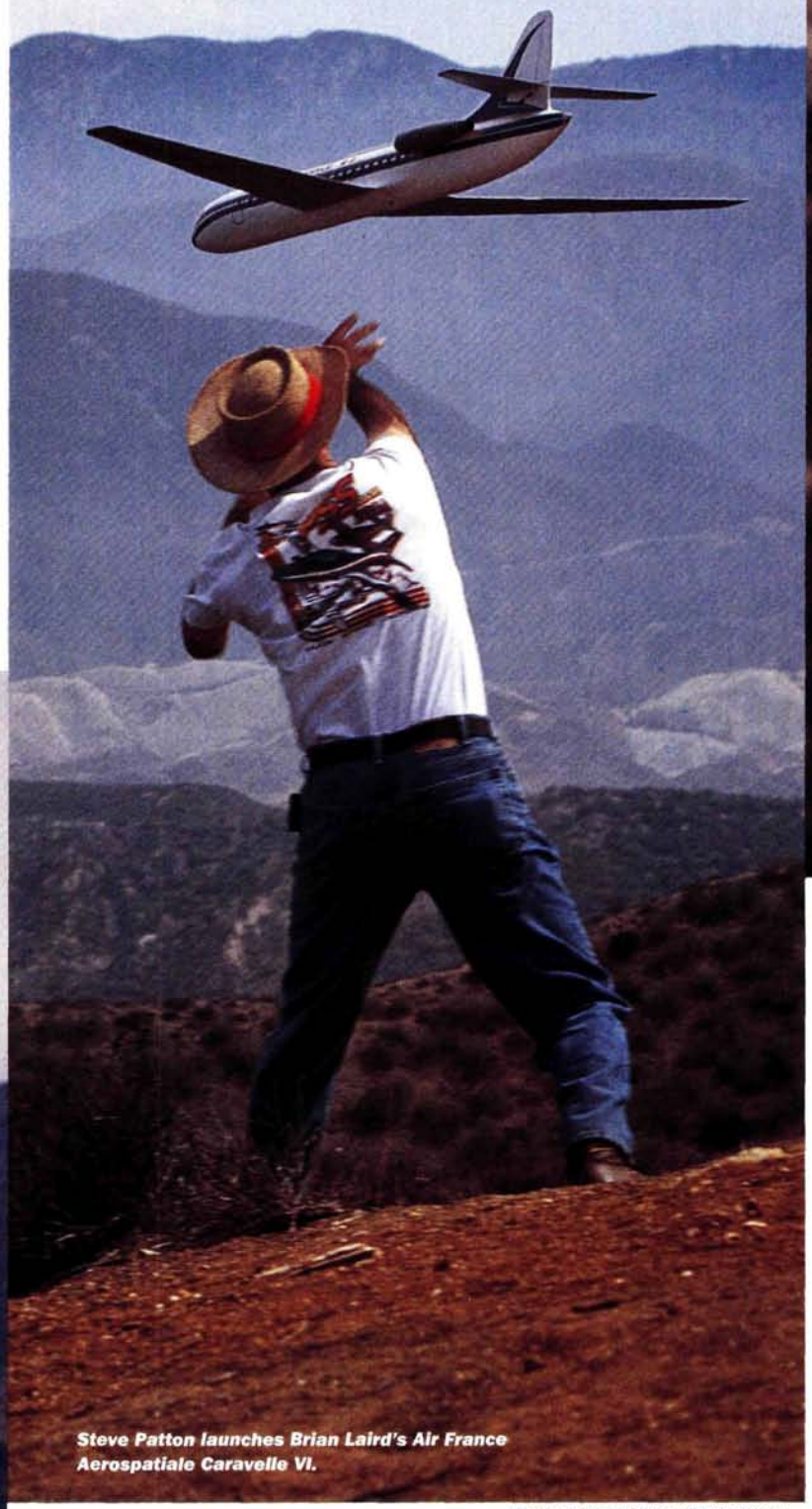
SOUTHERN CALIFORNIA POWER SLOPE SCALE FESTIVAL

Over-the-edge action at Cajon Summit

by Dave Garwood

Few gliders fire your imagination like a warbird or slope jet, and the place to see plenty of these planes in action is the annual Southern California PSS Festival. The Inland Slope Rebels club has staged this event for five years, and Cajon Summit has become the place to see and be seen if you're into power scale soaring (PSS) sailplanes that are built to a high level of craftsmanship and flown with take-your-breath-away showmanship.

Brian Laird's Air France Aerospatiale Caravelle VI.

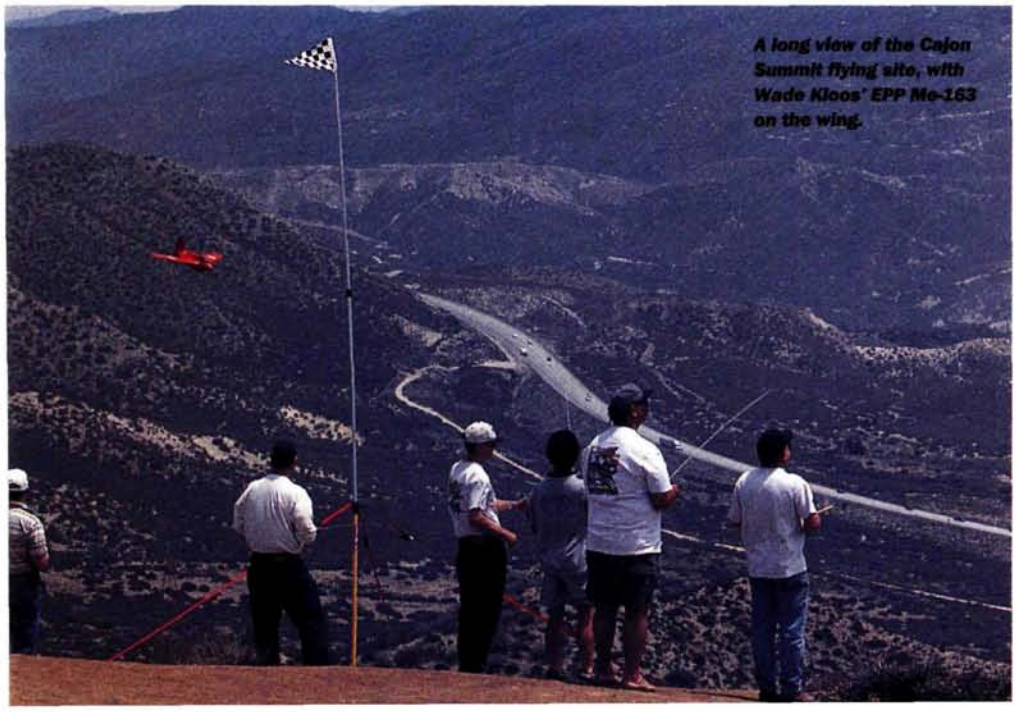


Steve Patton launches Brian Laird's Air France Aerospatiale Caravelle VI.

PHOTOS BY DAVE GARWOOD AND JOE CHOVAN

Wade Kloos' original design Messerschmitt Me-163 Komet, made from EPP foam.

Dave Wenzlick's Electric Jet Factory MiG-15, modified for slope soaring.



A long view of the Cajon Summit flying site, with Wade Kloos' EPP Me-163 on the wing.

The May 24 through 26 gathering of PSS builders and pilots above Cajon Pass in the San Bernardino National Forest, about 40 miles east of Los Angeles, was rewarded with excellent weather and plenty of lift on all three days, which allowed for impressive flights by some magnificent sailplanes. Forty-one pilots from Arizona, California, Idaho, Oregon and New York flew more than 100 planes.

THE SHOWSTOPPERS

Brian Laird's Aerospatiale Caravelle VI airliner in Air France markings was voted Best of Show—a tribute to Brian's design acumen, his craftsmanship and Top Gun flying skills. An original design with a foam fuselage covered with fiberglass and balsa-skinned foam wing with RG-14 airfoil, it spans 60 inches, is 55 inches long and weighs 4½ pounds. I got to see its maiden flight and can confirm that this fast-mover is responsive and highly aerobatic. Brian flew the jetliner as though it was a CAP-21 with rolls, loops and inverted passes. The plane took first place in the Civilian category judging.

Jeff Fukushima's new original-design Chance Vought F4U Corsair was big and had been detailed to an incredible level in a Rustoleum paint finish. Jeff's 64-ounce plane has an all-molded fuselage and molded spinner with radial engine detail, and its 50-inch-span wings are balsa-sheeted foam-cores. Jeff will kit this plane through his company, Vortech Models.

SPONSORS

Airtronics
Boomerang Wings
Cavazos Sailplane Design
Dave's Aircraft Works
Hitec RCD
Hobby People
M&M Glidertech
Mountain Toys
Multiplex USA
Patton Aircraft
Reese Productions
ShredAir, Sky Tools
Slickcraft
SR Hobbies
Trick R/C
Vortech Models

Tom Henscheid's EPP-foam Beech-17 Staggerwing—a Mountain Toys kit.

Another great flyer was Dave Wenzlick's MiG-15 that had been converted from an Electric Jet Factory kit for slope flying. It has a fiberglass fuselage with balsa-sheeted, plug-in, white-foam wings. The full-flying stab is made of sheet balsa. Air is allowed to flow through the fuselage. It weighs 32 ounces, and the fuselage is painted Rustoleum silver; the wings and stab are covered in silver UltraCote. The way Dave had it set up, the plane was an incredibly smooth flyer.

We were happy to see Dan Sampson's beautiful Sukhoi Su-25 Frogfoot ground-attack jet—the Soviet counterpart to the A-10 Warthog tank buster. Working from a Carl Maas molded fuselage, Dan carefully finished his Frogfoot in a Czechoslovakian airshow scheme—a great example of what a dedicated modeler can do with an airbrush. Dan's "Frogger" flew great, and Carl and Dan showed us a plane that's rarely modeled, either as a powered plane or a glider.

Another memorable plane, finished exquisitely and flown well, was Brian Laird's original-design Messerschmitt Me-262 Stormbird WW II twin-jet interceptor, an original design in molded fiberglass. Brian doesn't foresee kitting the plane, as "You have to build three fuselages," but it looked mighty fine in the air. Observers commented that the Frogfoot, Stormbird and Corsair looked like full-scale aircraft in the sky.

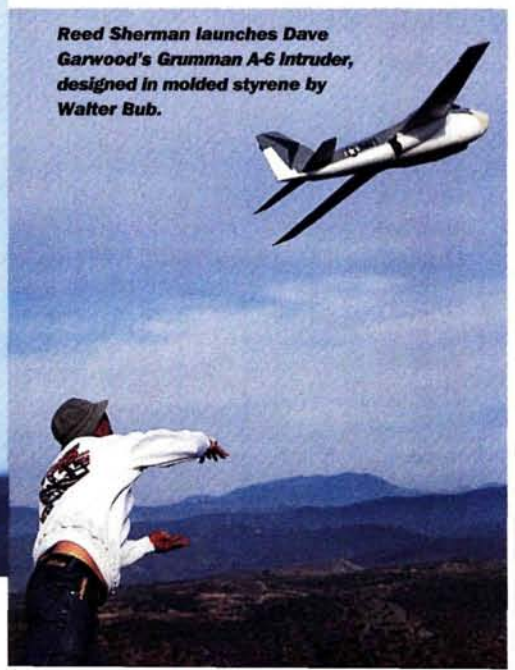
We saw a pair of EPP-foam Bell X-1 rocket planes—the first manned aircraft to break the sound barrier in level flight. One was by Merrill Brady, and the other was by Jack Mullen. This plane just "looks right" as a fast slope glider, and now I wonder why we haven't seen it modeled for PSS before. That's why you go to a major league PSS event, though: to see new planes fly.

Flying at Cajon Summit for the first time was Idahoan Tom Henscheid, a PSS designer who's known for his multi-engine bombers and P-38 Lightning constructed of EPP foam. Tom flew a pair of new Beech-17 Staggerwing biplanes, and they'll be available as a kit from his company, Mountain Toys.

My personal hero for large-scale, original-design planes sculpted in EPP foam is Wade Kloos. Slope-jet fans may remember his big, blue T-33 that graced the cover of the September 1999 issue of *Model Airplane News*; this year, his new plane was a huge Messerschmitt Me-163 Komet. Wade knows how to fly for the camera and can soar his planes for hours, carving graceful turns.

Rounding out the list of new, innovative and amazing models were Dave Cairn's F-4 Phantom modified from a kit; Carl Maas's super-detailed, small-span Me-109; and Bob Marks's innovative Rutan Ares canard-wing design. Mitch Schwartzburg also did a great job of finishing a Slope Scale F-80 Shooting Star. I was happy to get substantial stick time on my Walter Bub A-6 Intruder carrier attack bomber before it ended its useful life by landing in a manzanita bush. Ian Sanders, a 12-year-old rocker from Orange County, CA, was the youngest competitor,

Jeff Fukushima's Chance Vought F4U Corsair, an original design with molded-fiberglass fuselage and balsa-sheeted foam wings. This plane may become a Vortech Models kit.



Reed Sherman launches Dave Garwood's Grumman A-6 Intruder, designed in molded styrene by Walter Bub.

and he handily showed us how to wring out a Slope Scale P-51 Mustang, as well as several Dave's Aircraft Works foam mini-warbirds.

Due to its topography, Cajon Summit is a wonderful site for handling the tricky problem of having wind on the contest day. As the high desert heats up during the day, air is drawn from below the Summit and is compressed by Cajon Pass, so winds are reliable and plentiful at this flying site. In past years, the daily wind pattern has gotten a late start, and we even have had a couple of days with fog at the top of the Summit. This year, however, we had three straight days of 20 to 30mph winds straight up the slope starting between 10 a.m. and noon each day with generally clear skies and typical Southern California warmth and sunshine.

We learned again that the dedicated Inland Slope Rebels can really put on an event, including plenty of time to fly all types of slope planes, casual but serious static judging, an impressive raffle and great food. For more photos of this and previous PSS Festivals and for information about next year's event when it becomes available, see the ISR website at ourworld.compuserve.com/homepages/ISR.

Brian Laird's BD-5 in fantasy paint scheme from a Slope Scale kit.

CAJON SUMMIT AWARDS

BEST OF SHOW Brian Laird's scratch-built Caravelle airliner

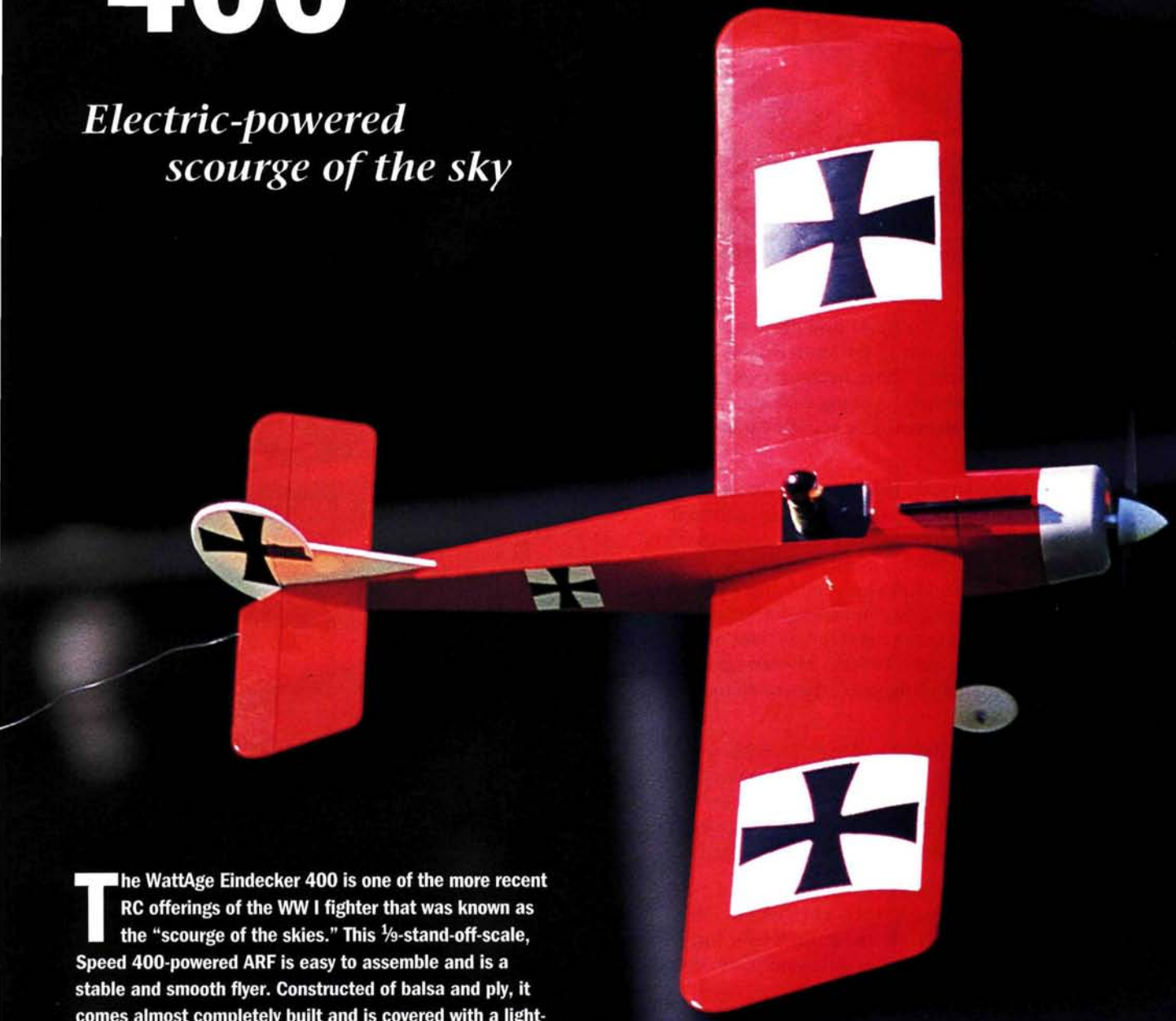
PLACE	NAME	MODEL
AWARDS FOR FOAM MODELS		
1st	Ren Dileo	Durable Aircraft Models Me-109
2nd	Bob Marks	Scratch-built Scaled Composites Ares
3rd	David Cairns	Modified Combat Models F5 TigerCat
4th	Merrill Brady	Scratch-built Bell X-1 rocket plane
5th	Tom Henscheid	Scratch-built Beech-17 Staggerwing
AWARDS FOR PROP MODELS		
1st	Carl Maas	Scratch-built Me-109
2nd	Jeff Fukushima	Original-design F4U Corsair
3rd	Ralph Roberts	Scratch-built P-38 Lightning
4th	Russ Thompson	Scratch-built Spitfire
5th	Ian Sanders	Slope Scale P-51
BEST JET MODELS		
1st	Dan Sampson	Carl Maas-designed Su-25 Frogfoot
2nd	David Cairns	Modified kit F-4 Phantom II
3rd	Mitch Schwartzburg	Slope Scale F-80
4th	Jeffrey Alejos	Vortech Models T-33
5th	Wes Pearson	Slope Scale BD-5J
BEST CIVILIAN PLANE		
1st	Brian Laird	Scratch-built Caravelle airliner
2nd	Dan Sampson	Slope Scale 60-in. Super Tucano
3rd	Paul Masura	Original-design BD-5
4th	Rick Schwemmer	Slope Scale P-39 Aircobra
5th	Carl Maas	Slope Scale 48-in. Super Tucano

FLIGHT TEST

WattAge Fokker Eindecker 400

by Roger Post Sr.

Electric-powered scourge of the sky



The WattAge Eindecker 400 is one of the more recent RC offerings of the WW I fighter that was known as the "scourge of the skies." This 1/9-stand-off-scale, Speed 400-powered ARF is easy to assemble and is a stable and smooth flyer. Constructed of balsa and ply, it comes almost completely built and is covered with a lightweight, iron-on film. You need to supply only the radio, a battery pack and the required tools to complete it, and that process should take only a couple of days.

SPECIFICATIONS

MODEL: Fokker Eindecker 400

MANUFACTURER: WattAge

DISTRIBUTOR: Global Hobbies

TYPE: 1/9-stand-off-scale ARF

WINGSPAN: 42¼ in.

WING AREA: 340 sq. in.

WEIGHT: 24.5 oz.

WING LOADING: 10.38 oz./sq. ft.

LENGTH: 31½ in.

POWER SYSTEM: Speed 380 motor w/gear drive and 8x6.25 prop (included)

RADIO REQ'D: 3-channel w/2 microservos (elevator, rudder and speed control)

RADIO USED: Hitec Focus 3 FM radio w/a 555 receiver, two Cirrus CS-21BB microservos and a WattAge 1C-15 ESC

BATTERY USED: Sanyo 8-cell, 800mAh NiMH

PRICE: $119.99

FEATURES: comes completely built of balsa and ply and covered with lightweight, iron-on film; Speed 380 motor with matching gearbox and prop included; package includes lightweight, scale wheels, factory-painted pilot and gun, a spinner with adapter and all of the necessary hardware.

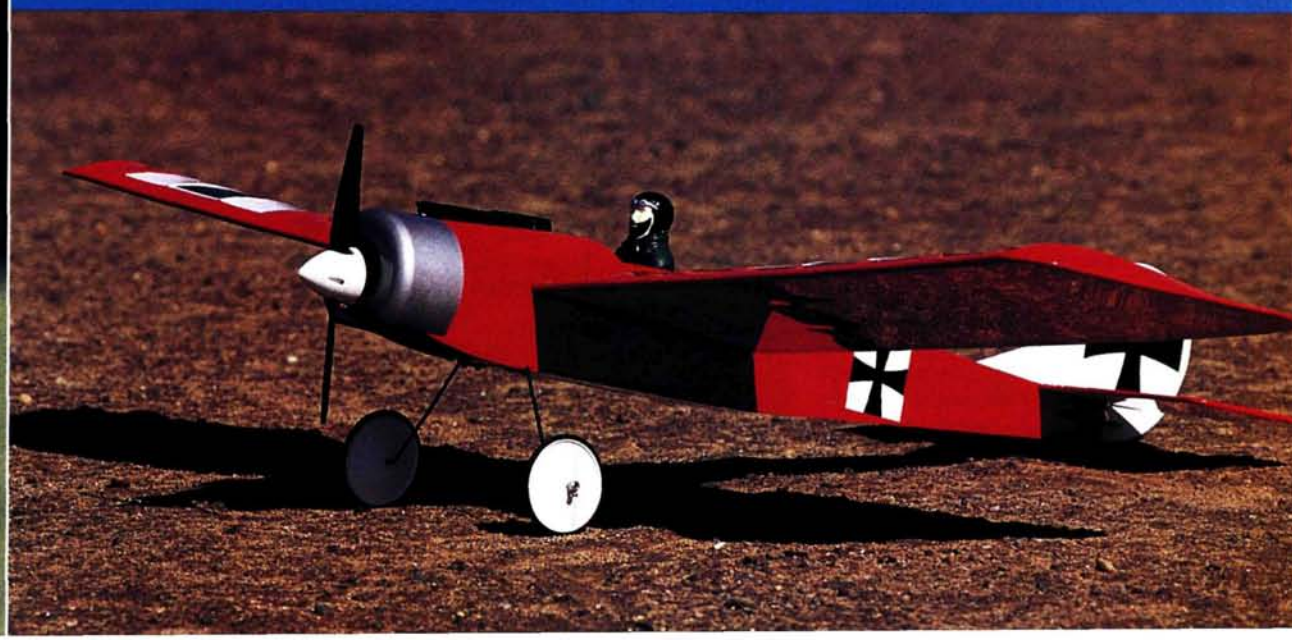
COMMENTS: because the Eindecker is easy to assemble, it shouldn't take more than a couple of days to have it ready to fly. The overall quality of this ARF is quite good. It's very stable in flight and can perform mild aerobatics.

HITS

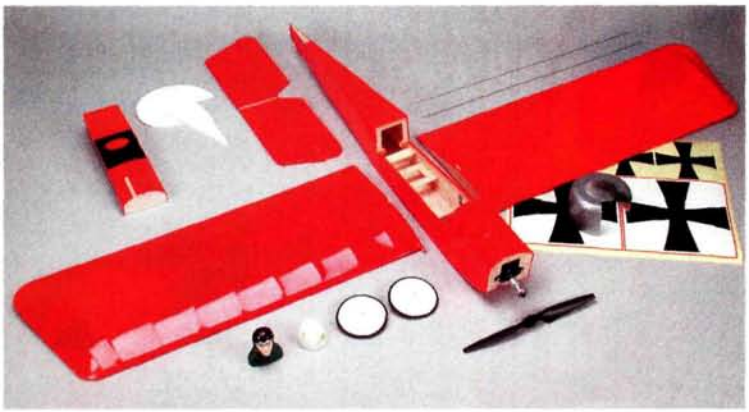
- Can be assembled quickly.
- Lightweight construction.
- Smooth flight characteristics.
- High-quality parts.

MISSES

- Wing decals do not conform well to concave surfaces.



PHOTOS BY WALTER SIDAS AND PETER HALL



The WattAge Eindecker comes with everything you see here, including the Speed 380 motor with gearbox. You have only to supply the radio gear and a battery pack.

ASSEMBLY

Before you assemble the model, be sure to read the manual in its entirety and familiarize yourself with the parts. With that accomplished, you can move on to the first step: breaking in the motor. Though the manual says this is optional, I recommend that you do it; it's a good opportunity to check out your radio, battery pack and ESC before you install them in the fuselage. WattAge recommends that you lightly spray the inside of the motor with Performance Plus Motor and use Trinity Break-in Drops on each of the motor's and gearbox's two bushings (a total of four).

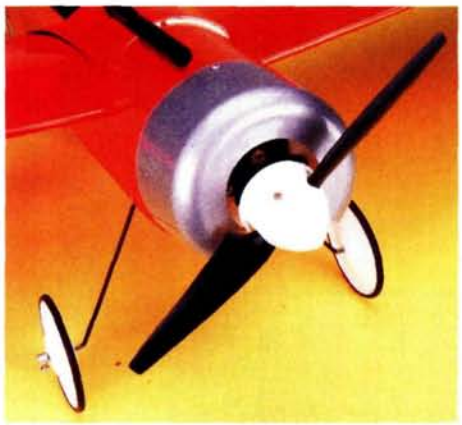
Next, assemble the wing halves per the directions. Be sure to check their alignment as the epoxy cures, and do not allow the epoxy to get into the predrilled hole for the wing hold-down bolt. Once the epoxy has cured, examine the joint for any gaps between the wing panels, and if necessary, fill them with 5-minute epoxy.

Before you attach the wing, put some thin CA in the predrilled hole for the wing's hold-down bolt to harden the threads. When it's completely dry, attach the wing with the supplied hold-down bolt and leave it attached while you mount the horizontal and vertical stabilizers. Their alignment must be checked with the wing and with each other.

Once you've properly aligned and secured the horizontal and vertical stabilizers, you can remove the wing and mount the landing-gear wire and wheels. Make sure that the nylon gear straps do not overlap onto the battery hatch cover and that each wheel spins freely.

Before you hinge the elevator and rudder, cut the required notches in these surfaces for the control horns and then glue the horns into place. The front of the elevator's control horn must be notched to fit over the elevator's joining wire. Next, CA the hinges into place and give them a slight tug to ensure that they are permanently attached. The same applies to the elevator and rudder after they have been installed.

Install the servos per the manufacturer's instructions, and hook up the elevator and rudder pushrods. Make a Z-bend in the end of the pushrod to be attached to the servo and then insert it through the center hole of the servo arm. Follow the directions exactly when connecting the pushrods to the two control horns, and be sure to leave at least 5/16 inch of wire beyond the required 90-degree bend at the control-horn end. After you've connected the pushrods, ensure that the control surfaces deflect in the correct direction and that



A 6mm adapter is supplied to help fit the spinner to the prop shaft. When you attach the cowl, be sure to leave at least ¼-inch clearance between the front of the cowl and the back of the prop blades.

FLIGHT PERFORMANCE

With the fully charged NiMH pack installed, and the aircraft's balance point and flight-control directions checked, I was off to the field. Fortunately, the wind was calm—perfect conditions to test-fly an electric slow flyer.

TAKEOFF AND LANDING

After a gentle hand-launch, the Eindecker climbs with authority. A little right rudder is all it needs to keep the tracking straight. When taking off from a runway of short grass or pavement, the Eindecker can be airborne in about 25 feet (slightly less for the pavement).

To land, gradually lower the throttle during the landing pattern, and finesse the Fokker in for a smooth touchdown with a gentle flare, just inches from the ground. The Eindecker has a fairly low approach speed, so landings will not raise your blood pressure.

LOW-SPEED PERFORMANCE

To achieve slow flight, lower the throttle to 30 percent and add enough up-elevator trim to prevent the model from descending. The model's controls are very effective at slow speeds, and its power-off stall can be arrested with the addition of some power and release of the backpressure. At low speeds, the 800mAh NiMH battery provides about 10 minutes of flight time.

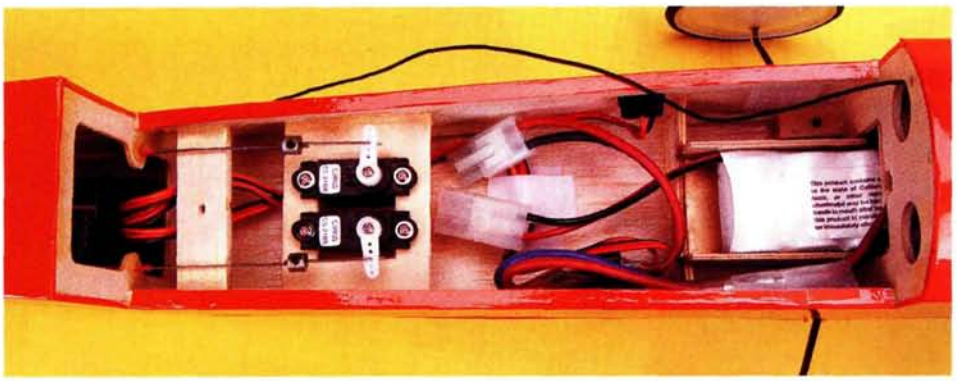
HIGH-SPEED PERFORMANCE

The Eindecker was not designed for high-speed flight.

AEROBATICS

Because of its lightweight structure, be careful when pulling some G with this aircraft. Gentle wingovers and spins with a power-off recover are doable, but high-speed dives that end with an abrupt pull might cause a structural problem. If you perform a loop, be sure its back side is power-off.

Overall, the WattAge Eindecker is a stable slow flyer that can be flown in a ballpark or in a field. It should be flown at moderate power settings with smooth flight inputs.



The Eindecker's fuselage has plenty of room for all the radio gear, and that really eases the installation. Following the instructions, I used a Z-bend at the servo end of the pushrods and inserted them through the center hole of the servo arm.

they have the required amount of throw.

The next step is to attach the spinner. Watt-Age supplies a 6mm adapter that must be inserted into the spinner's backplate so that its inner diameter fits the propeller shaft. Install the spinner backplate, propeller and spinner front cone per the instructions. The propeller should be centered bet-ween the two pins on the backplate. Be careful not to overtighten the screws that hold the cone in place; doing so could crack the spinner. Then you can install the cowl, making sure that there is at least ¼-inch clearance between the front of the cowl and the back of the propeller blades.

Next, attach the pilot and machine gun to the cockpit deck and secure the deck to the wing. There is a small plywood block that is glued onto the top of the wing that the cockpit deck hold-down screw goes into. I used epoxy instead of CA when I glued the block to the wing. After the epoxy dries, you drill a pilot hole into the block, being certain not to drill too deep. Then use the supplied screw to finish the hole. Again, I applied some thin CA to the newly created threads for added strength.

For the final part of the assembly, install the remaining radio items per the instructions, attach the wing and check the aircraft's balance. The final touch is to apply the decals. This was fairly easy to do, but the decals for the wings did not easily conform to the concave sections between the ribs. Be patient when applying these.

I have had many great flying experiences with my Eindecker. It surely would be nice to see more high-quality WW I models on the market. Who knows? We may soon see a whole new style of ballpark dogfighting, with models that actually look and fly like the real thing. See you at the field.

Cirrus; distributed by Global Hobby.

***Global Hobby Distributors** (714) 963-0133; globalhobby.com.*

***Hitec RCD Inc.** (858) 748-8440; hitecrcd.com.*

WattAge; distributed by Global Hobby.

Hangar 9 Sukhoi SU-31 ARF

by Jim Onorato

The Russian-made Sukhoi SU-31, with its 400hp Vedeneyev M14 radial engine, has the highest power-to-weight ratio of any production piston airplane in existence. This monstrous excess of power gives it an awesome climb rate of 3,543 feet per minute and an unrivaled sustained vertical climb, while its composite airframe can sustain up to 12 positive G. The Sukhoi SU-31's responsiveness and agility also make it an outstanding aerobatic airplane. With its fully balanced controls and blazing 400-degrees-per-second roll rate, you could say it's a top fuel dragster with the handling manners of a Porsche.

Hangar 9 has captured the essence of this Russian wonder in a ⅛-scale-looking ARF that promises to be just as exciting as the full-scale version.

WHAT'S IN THE BOX?

The Sukhoi is completely built (though not assembled) and beautifully covered with red, yellow and blue UltraCote, with most of the graphics already applied. The craftsmanship is topnotch, and the plane's overall appearance is outstanding. The plug-in wings are built up of balsa and lite-ply with the servo and hinge pockets already cut out. All control surfaces are dual-beveled at the hinge line, which allows more than 45 degrees of throw for radical freestyle maneuvers. The vacuum-formed canopy and forward turtle deck form a one-piece hatch that allows easy access to the interior of the fuselage. The Sukhoi has a painted fiberglass cowl and wheel pants as well as rugged, painted-aluminum landing gear. I thought the color match between the painted parts and the red UltraCote was pretty close, but not exact.

The fuselage is extremely light for its size and is made of lite-ply and has a balsa-sheeted foam turtle deck. The vertical fin is an integral part of the fuselage and it has

Quick-build, ⅓-scale Russian aerobat

PHOTOS BY WALTER SIDAS & PETER HALL

SPECIFICATIONS

MODEL: Sukhoi SU-31

MANUFACTURER: Hangar 9

DISTRIBUTED BY: Horizon Hobby Inc.

TYPE: ⅛-scale unlimited aerobatic aircraft

WINGSPAN: 97 in.

WING AREA: 1,810 sq. in.

LENGTH: 88.7 in.

WEIGHT: 25 lbs., 10 oz.

WING LOADING: 32.62 oz./sq. ft.

ENGINE REQ'D: .60 to 80cc

ENGINE USED: Zenoah GT-80 twin gasoline engine

RADIO REQ'D: 4-channel w/9 servos (ailerons [4], elevator [2], rudder [2], throttle)

RADIO USED: JR XP8103 transmitter, JR 649S-PCM receiver w/4 JR8231 servos for ailerons, 4 JR8411 servos for rudder and elevators, JR 517 for throttle and JR 241 for remote engine kill switch

PROP: Mejlic 24x10 carbon fiber

STREET PRICE: $849.99

FEATURES: built balsa and ply ARF covered with UltraCote; painted fiberglass cowl and wheel pants; plug-in wing and stabilizer; hefty, painted-aluminum landing gear; photo-illustrated instruction manual includes 3D flying tips.

COMMENTS: designed by expert pilot Mike McConville, the Hangar 9 Sukhoi SU-31 is a big, no-nonsense airplane intended for the experienced modeler who wants the perfect combination of scale appearance and outstanding flying characteristics. It's a high-quality ARF built to withstand the rigors of aerobatic flying at the highest level.

HITS
- Excellent flight performance.
- Easy-to-follow instructions with flying tips by Mike McConville.
- Expertly covered.

MISSES
- Painted parts and UltraCote covering did not perfectly match.

an airfoil shape, as do the rudder and plug-in stabilizer and elevators. The kit does not come with any hardware, but an optional hardware package is available from Hangar 9 that includes just about everything you need to complete the Sukhoi (except engine and radio). The contents of the optional hardware package are listed in the instruction manual so you

The tinted canopy comes as you see it—trimmed, painted and ready to install on the fuselage.

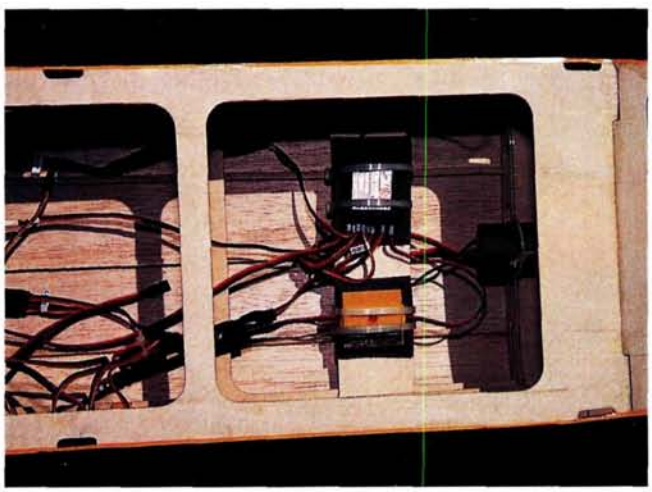
can decide whether you want to use any or all of the hardware. The 44-page instruction book is full of photos and very well written with lots of detail. It lists the equipment, parts, tools and adhesives needed for each step. And, to put icing on the cake, it also includes some great setup and flying tips by designer and Tournament-of-Champion pilot Mike McConville.

ASSEMBLY

Wing. The Sukhoi is built so that most of the assembly work involves hinging the control surfaces and installing the servos, linkages and engine. The plug-in wing is well designed and easy to install. First, make sure the alignment pin in each wing root is securely glued into place. Slide the joiner tube into a wing panel and then slide the assembly into the fuselage. Slide the other wing panel onto the tube, lining up the alignment pin with the holes in the fuselage. Then secure the wing panels to the fuselage from the inside using the ¼-20 bolts that screw into the root ribs.

Each aileron requires two servos with a minimum torque of 60 ounces. I used four JR 8231 digital servos that have a torque of 88 ounces, and I replaced the stock servo arms with the heavy-duty metal arms included in the optional hardware package. All of the control surfaces are hinged with Robart Super Hinge Points, and the holes for the hinge points are already drilled; this makes an often difficult job very easy. To hook up the ailerons to the servos, I used the recommended Nelson Hobby control horns, ball links and the 4½-inch-long Hangar 9 titanium Pro-links. The Pro-links have right-hand threads on one end and left-hand threads on the other, which means they can be easily and accurately readjusted without being disconnected. The Nelson Hobby ball links have left-hand threads and work well with the Pro-links.

Because the model uses two servos per aileron, special attention is required during setup to ensure that the servos do not fight each other and drain the battery. The key here is to pair up servos that have exactly the same neutrals and keep the geometry for both linkages the same; the instructions cover this procedure in great detail. I attached a 6-inch and 24-inch servo extension to the inboard and outboard servos respectively and then connected each servo to a Y-harness. You must do this for both wing panels. I then connected the two Y-harnesses into two different channels and used the flaperon-



Above: Hangar 9 suggests you cut a series of holes in the bottom of the fiberglass cowl to properly cool the engine; a Dremel Moto-Tool makes this easy. The Zenoah GT-80 and the Slimline mufflers fit nicely within the cowl for a nice finished look.

Left: access to the radio compartment is via the forward turtle deck, and it exposes the interior of the fuselage from the firewall to the rear of the canopy. The Sukhoi certainly has plenty of room!

FLIGHT PERFORMANCE

After I range-checked my radio with the engine running at full throttle, I topped off the tank and was ready for the initial flight. I set the control throws and exponential values as recommended in the instructions and set all the dual-rate switches for low rate.

TAKEOFF AND LANDING

The Sukhoi is firm on the ground and taxis nicely without any tendency to nose over. On the takeoff roll, the tail lifts almost immediately and the Sukhoi tracks straight without any rudder input. I usually let it roll for about 100 feet. Then I apply just a touch of up-elevator, and the Sukhoi lifts smoothly into the air without rotating. The power of the GT-80 is very apparent!

The Sukhoi lands best under power. I keep the throttle slightly above idle while the plane is on final approach and adjust the throttle as needed to maintain altitude and speed. As the plane crosses the threshold, I cut to idle just as I flare the Sukhoi for beautiful three-point landings.

LOW-SPEED PERFORMANCE

The Sukhoi can be flown at slow speed without losing stability, and it can execute all but vertical maneuvers at part throttle. Although slightly less responsive at low speed, it is still smooth and predictable. The plane practically stops in midair during induced stalls, then it falls straight ahead. Once you apply power, the plane will recover immediately.

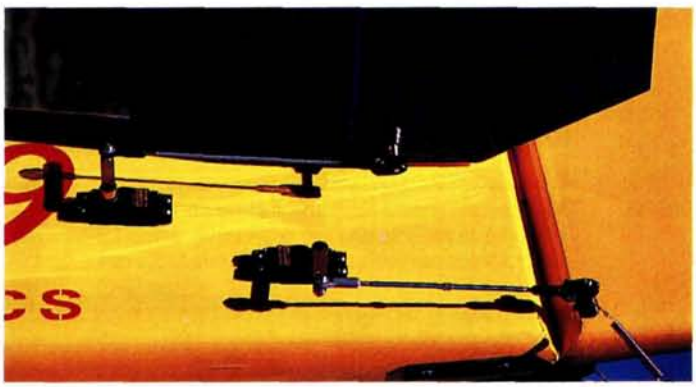
HIGH-SPEED PERFORMANCE

At high speed, the Sukhoi is a "go where you point it" airplane. It tracks extremely well and is a smooth and stable flyer; however, it should be flown like a full-scale Sukhoi, as the instructions caution that full-throttle dives may cause the airframe to fail. This is the case with all giant-scale aerobatic models, so throttle management is absolutely necessary; if the nose is down, you have to reduce the throttle.

AEROBATICS

The Sukhoi is a proven aerobatic airplane and is capable of every imaginable maneuver, including many that are way beyond my abilities. While I have not yet attempted any 3D maneuvers (which it is very capable of), I have put it through fairly aggressive aerobatic routines. Inside and outside snap rolls are fast and can be performed with the plane heading up, down or level; it doesn't make any difference. Axial rolls are incredibly fast and truly axial. Sustained knife-edge requires a little elevator input to offset minor pitch coupling. I easily took care of this by using a program mix. The Sukhoi spins easily and recovery is immediate—just release the controls. When the Sukhoi is rolled to inverted flight, it flies "hands off" as straight as an arrow. Lomcevaks and other tumbling maneuvers are second nature to the Sukhoi and are truly awesome.

The Zenoah GT-80 twin is a powerful engine, and it gives the Sukhoi superb vertical performance. Hangar 9 claims a Zenoah G-62 is adequate for good sport power, but the GT-80 lets you enjoy the Sukhoi at its best.



Above: the servos look micro size when they're mounted in their respective openings. I used the optional hardware package for the servo arms, pushrods and links. Having everything on hand helps speed assembly.

Right: two servos are required to control each aileron. The detailed instructions provide the information needed to properly set them up.

mixing function on my JR XP8103 transmitter. If you don't use a computer radio, you will need an additional Y-harness to connect the aileron servos to the receiver.

The instructions state that sealing the aileron and elevator hinge gaps is mandatory, and that failure to do so may cause control surface flutter. The material required to seal the hinge gaps is included in the kit.

Tail assembly. The Sukhoi uses removable stabilizers and elevators that plug into two aluminum tubes. The stabilizer halves are attached to the longer of the two tail tubes with 4-40x⅜-inch socket-head screws that are threaded through a hole in each stabilizer half and into the tube. A shorter tube is used to prevent rotation of the stabilizer.

The rudder and elevators require a minimum of 80 ounces of servo torque, and I used two JR 8411 digital servos (155 ounces of torque) for the rudder and two for the elevators. I mounted the servos in the provided cutouts on the rear of the fuselage after I replaced the stock servo arms with metal ones. I used Robart Super Hinge Points to hinge the rudder and elevators and Nelson Hobby control horns and ball links to connect them to the servos. I did not use the 5-inch Pro-links speci-

fied in the instructions; I found that they were too short for the elevators and too long for the rudder. I was able to use a pair of 4½-inch Pro-links for the rudder and regular 4-40 threaded rods for the elevators. (If you turn the elevator servos around, you can use the 4½-inch links, but I didn't have an extra set.) I used a Y-harness on the rudder servos and plugged the elevator servos into separate channels that I mixed together using one of the programmable mixes on my computer radio. If you don't use a computer radio, you'll have to use a reverse-direction servo for one of the elevator halves, or you can use a reversing Y-harness. After completing the rudder and elevator hookup, I installed the tailwheel.

Fuselage. Assemble the landing gear, wheels and wheel pants next and bolt them to the fuselage. Aluminum angles located inside the fuselage tie the gear to internal formers to make a very strong installation. To preserve the fuselage shape, the landing gear is recessed into the fuselage and then covered by a hatch.

I installed the receiver, battery and fuel tank, then the engine and cowl. I used two 5-cell battery packs (with a battery back-up system in case the main battery pack fails) for the receiver and placed them as far forward as possible. The 32-ounce fuel tank is just forward of the wing tube. To power the Sukhoi, I used the recommended Zenoah GT-80 twin gasoline engine equipped with a pair of Slimline mufflers. The firewall has built-in right thrust and is reinforced with aluminum angles. A nice touch is that the firewall is already drilled for the GT-80 (an adapter is included to install a G-62). I used a miniservo to operate a remote kill switch in the top of the engine box. I also mounted a manual kill switch on the side of the cowl. I then attached the cowl to the fuselage with four 4-40 socket head bolts.

The fiberglass wheel pants and aluminum landing gear are painted and ready to install. The paintwork was flawless and the color matched the covering very closely.

The GT-80 fits completely inside the cowl. As recommended by the instructions, I cut a series of openings in the bottom of the cowl to ensure proper cooling and to provide an exit for the exhaust.

Final touches. I installed a ⅓-scale Hangar 9 civilian pilot figure and a Hangar 9 scale instrument panel in the cockpit and then attached the canopy with Pacer Formula 560 glue and six small screws. The final touches were the addition of a Mejlic 24x10 prop and a 4-inch-diameter P-51 style Tru-Turn aluminum spinner. The instructions suggest a 4½-inch Ultimate-style spinner, but I thought the P-51 style looked better. Following the instructions, I set up the control throws and balanced the model. After a final systems check, the big Russian aerobat was ready to go.

CONCLUSION

Hangar 9's ⅓-scale Sukhoi SU-31 is a big, no-nonsense airplane that combines great scale appearance with outstanding flight characteristics. It is as well suited to experienced pilots who compete in IMAC competitions as it is to Sunday fliers just looking for some 3D excitement. Hangar 9 has gone all out to make the Sukhoi SU-31 a fantastic looking, high-performance flying machine. You won't be disappointed with this one! ✈

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Great Planes Giles G-202

by George Leu

The Giles G-202 was rewarded with a lot of encouraging looks when it was first introduced at the Florida Sun and Fun full-scale aerobatics event in the late 1990s, but it certainly was different. It was stubby, had a large wingspan, was a composite molded structure and just did not fit the typical designs of the time. As it turned out, the design succeeded where it was most important: in the air. The Giles has since earned its place among the all-time classic aerobats.

I've always wanted to try my hand at flying an IMAA-legal aerobatic design, so when Great Planes released a ¼-scale ARF version of the Giles G-202, I was really excited.

WHAT'S IN THE BOX?

The Giles arrived in a large box, and all of its parts were individually wrapped to protect them from shipping damage. The MonoKote covering was better than anything I had ever seen; the colors were brilliant, and the craftsmanship was superb. The compound curves in the rudder/fin area were beautifully done, and the colorful sunburst patterns on the wing and stabilizer perfectly matched that on the ailerons and elevator. I was very impressed!

Along with the expertly covered airframe, I found a beautiful

IMAA-legal aerobatic ARF

fiberglass cowl and wheel pants and a large plastic canopy. All were factory painted with fuelproof paint that was nearly identical to the MonoKote color scheme. When I placed the cowl in its correct position on the front of the fuselage, the masked paint aligned perfectly.

The G-202 also comes with a complete hardware package, including hinge material, control horns, a motor mount, wheels and a fuel tank. This, along with a very detailed, 30-page instruction manual, made the model very easy to build.

ASSEMBLY

I followed the construction manual explicitly, and I recommend that you do the same. This is a very well-engineered model, and the finished product reflects a great deal of thoroughness and attention to detail on the part of Great Planes.

Construction begins with the installation of the maple wing spar and the joining of the wing panels; I used epoxy on both. A hefty, factory-cut spar connects the two wing panels and ensures their perfect alignment. Neither step was very difficult, but you must be careful of the factory-installed string that extends from the servo cavities in the wing to the center rib of each wing panel. When you install the servos, use the string to help pull the wires through to the center of the wing. If the string gets into the glue joint area, however, you might find it difficult to connect your servo wires later on.

Each wing panel comes with holes already drilled for the wing

PHOTOS BY WALTER SIDAS

SPECIFICATIONS

MODEL: Giles G-202

MANUFACTURER: Great Planes

TYPE: ¼-scale aerobatic ARF

WINGSPAN: 73 in.

TOTAL WING AREA: 973 sq. in.

LENGTH: 64.5 in.

WEIGHT: 12½ lb.

WING LOADING: 29.6 oz./sq. ft.

ENGINE REQ'D: 1.20 to 2.0 2-stroke or 1.8 to 3.0 4-stroke

ENGINE USED: O.S. 1.60 FX 2-stroke w/Davis Diesel Pitts-style muffler

FUEL: Cool Power 15%

RADIO REQ'D: 4-channel w/6 servos (ailerons, rudder, elevators and throttle)

RADIO USED: Futaba 8UAF with R148DP receiver and 6 Futaba servos

STREET PRICE: $249.99

FEATURES: interlocking balsa and ply parts covered in MonoKote; factory-painted fiberglass cowl, wheel pants, belly pan and plastic canopy included; complete hardware package includes hinge material, control horns, wheels, motor mount, fuel tank and aluminum landing gear; detailed instruction manual.

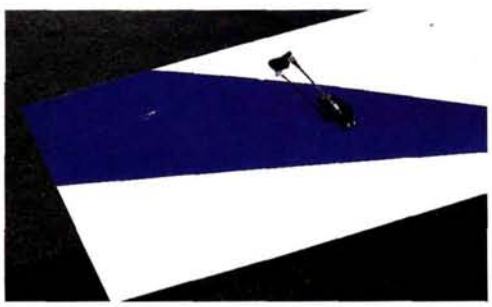
COMMENTS: I was extremely impressed by the quality of this plane. From the moment I opened the box, I could tell that all of the materials were topnotch, and this is definitely reflected in the G-202's outstanding flight performance.

HITS

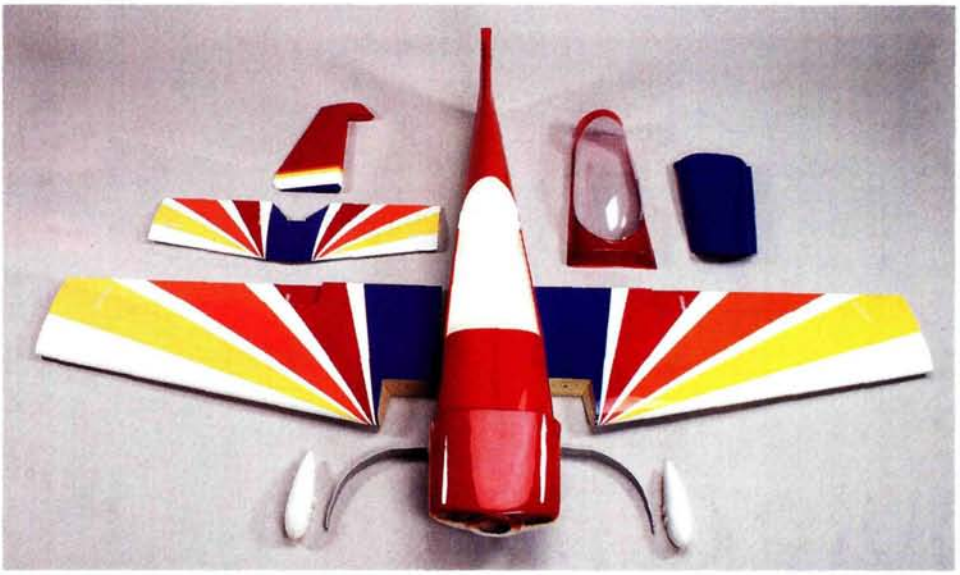
- Well engineered and expertly covered.
- Very complete hardware package.
- Great flight performance.
- Excellent paint finish on the cowl and canopy.

MISSES

- None.



I attached the control surfaces with the supplied CA-type hinges. I had never used them before, but I found them easy to install, and they worked great. The locations for the aileron servos had already been cut in the wing halves, and this made their installation a breeze.



I was extremely impressed by the MonoKote covering. The colors are brilliant, and the sunburst patterns align perfectly. The finish was better than anything I had ever seen. Here, you see the parts as they come out of the box.

bolts, and mating ¼-20 T-nuts are in the fuselage. Because I had not checked the alignment before I joined the wing panels, I seriously doubted the accuracy of the match. Boy, was I wrong; the wing mounted on the fuselage perfectly.

The G-202 comes with a very complete hardware package that really eases the assembly and lessens building time.

When the wing was in place, I was ready to install the stabilizer. The directions advise you to cut the MonoKote away from the area on the stab that will be glued to the fuselage saddle. First, insert the stabilizer into the fuselage and make sure that the stabilizer and wing are perfectly aligned. The instruction manual thoroughly addresses the proper method of alignment, and if you follow the procedure exactly, it should take only a few minutes. Then just mark the area to be cut away with a felt-tip marker, and cut and remove the MonoKote.

I used the supplied CA hinges to attach the control surfaces. Though I had never used this type of hinge before, I decided to follow Great Planes' instructions exactly. Once again, the installation took little time, and all of the pieces were attached within minutes.

Next, I mounted the landing gear and wheel pants and installed the servos in their specific precut locations. By this time, I realized that the Giles was going together at a faster rate than I had thought possible. The manual suggested about 15 to 20 hours of building time, but I was only about 8 hours into the building process, and the plane was nearly finished.

ENGINE INSTALLATION

I chose an O.S. 1.60 FX for power, and this was where the project got a little complicated. The engine was large, but the large fiberglass cowl could easily have accommodated it. The stock muffler, however, would not fit; it jammed against the firewall. For this setup, I needed a Pitts-style muffler, but O.S. did not make one for its 1.60 engine.

I decided to use a Davis Diesel Pitts-style muffler, which was designed to quiet the engine without robbing it of any power. (After flying my plane with this muffler, I must say it works as advertised.) The muffler fit the engine area fine, but I had to purchase some flexible copper tubing from a plumbing supply company to connect the engine header to the muffler. I attached the tubing with some sheet-metal screws and sealed the joints with high-temperature silicone adhesive. It has

FLIGHT PERFORMANCE

Before I take off, I always perform a complete preflight inspection. After I made some minor trim adjustments, the Giles and I were ready to go.

TAKEOFF AND LANDING

The Giles taxies very well, with no tendency to nose over. You may encounter crosswinds, though, so be ready to use rudder as necessary. Takeoffs are very easy and fairly short. Advance the throttle, hold it straight and keep slight backpressure on the elevator until the model reaches sufficient takeoff speed. When you release the backpressure, the tail will rise, and the Giles will become airborne by itself. Once in the air, some down trim and right aileron were necessary for straight and level flight. The O.S. 1.60 FX has plenty of power; takeoffs require only a little more than ½ throttle.

Landings are equally easy. Just line it up on final, reduce power and let it settle into its groove. The Giles is very solid and shows no tendency to tip-stall. Always hold some throttle until the plane is over the threshold. When you do cut the throttle, the Giles settles easily. A little up-elevator is all that's needed to flare for soft 3-point landings. Wheeled landings look great also.

LOW-SPEED PERFORMANCE

The Giles can be slowed quite a bit before it stalls. When it does, the stall can be easily managed because the G-202's large control surfaces allow you to maintain good control right up to the moment it stalls. Low-speed aerobatics are a lot of fun and easy to perform.

HIGH-SPEED PERFORMANCE

When I shove the throttle forward, the Giles really moves out. It does not require any trim changes between high and low throttle. The Giles grooves right along and responds nicely to control inputs; it feels a lot like a pattern plane.

AEROBATICS

Just like its full-scale counterpart, this Giles excels at aerobatics, but I did find the recommended elevator throw to be a bit too sensitive and the ailerons to be a tad too slow. It tracks well in looping

maneuvers, both inside and outside. It rolls as if it's on a string and also tumbles well. Inverted flight requires slight down-elevator. The Giles knifes well, with little cross-coupling. Snap maneuvers are graceful and stop quickly. As with all large-scale aircraft, throttle management is mandatory to help prevent flutter. All in all, the Great Planes Giles G-202 is one smooth-flying aerobat. —*Rick Bell*

The O.S. 1.60 engine fit easily beneath the cowl, but the stock muffler fit too tightly against the firewall. I installed a Davis Diesel Pitts-style muffler in its place, which really quieted the engine but did not seem to rob it of any power. Right: a model with a clear canopy begs for a scale pilot figure.

worked well, and I would probably use this type of product again if faced with a similar challenge.

The O.S. 1.60 engine came with a remote needle valve, which I mounted on the firewall, separate from the engine mount. Because I used Du-Bro soft mounts to attach the engine to the firewall, I was worried that the shaking of the needle valve might affect the engine-throttle adjustments. To date, I have had no problems with the location of the needle valve, and the O.S. 1.60 has shown no tendency to vibrate excessively on the isolation mounts.

SPECIAL TOUCHES

For some added appeal, I obtained a Tru-Turn spinner. It's beautifully machined and fits the engine and Zinger 16x8 propeller perfectly. Before I installed it, I checked the spinner balance, and it was perfect. The spinner exhibits no vibration when the O.S. is revved up or idled, and this proves that it was balanced very well at the factory before it was shipped. The all-aluminum finish added a nice touch to the plane and really made the MonoKote and painted colors stand out.

Because the Giles G-202 has such a large canopy, it was important for me to have a nice cockpit interior along with a good scale pilot to do the plane justice. I added a scale dashboard from SAC in Florida and a beautifully painted scale pilot figure. Both perfectly complemented the Giles and added to its overall appeal.

CONCLUSION

The Giles G-202 took about 10 hours to complete—much less than the 15 to 20 hours suggested by the manual. The finished product looks so good, I wish I could claim that the design and construction were my own. From start to finish, the Giles G-202 is a top-quality product.

Cool Power; *a product of Morgan Fuel (800) 633-7556; morganfuel.com.*

Davis Diesels *(203) 877-1670.*

Du-Bro Products *(800) 848-9411; dubro.com.*

Futaba; *distributed by Great Planes; futaba-rc.com.*

Great Planes *(800) 637-7660; greatplanes.com.*

O.S.; *distributed by Great Planes; osengines.com.*

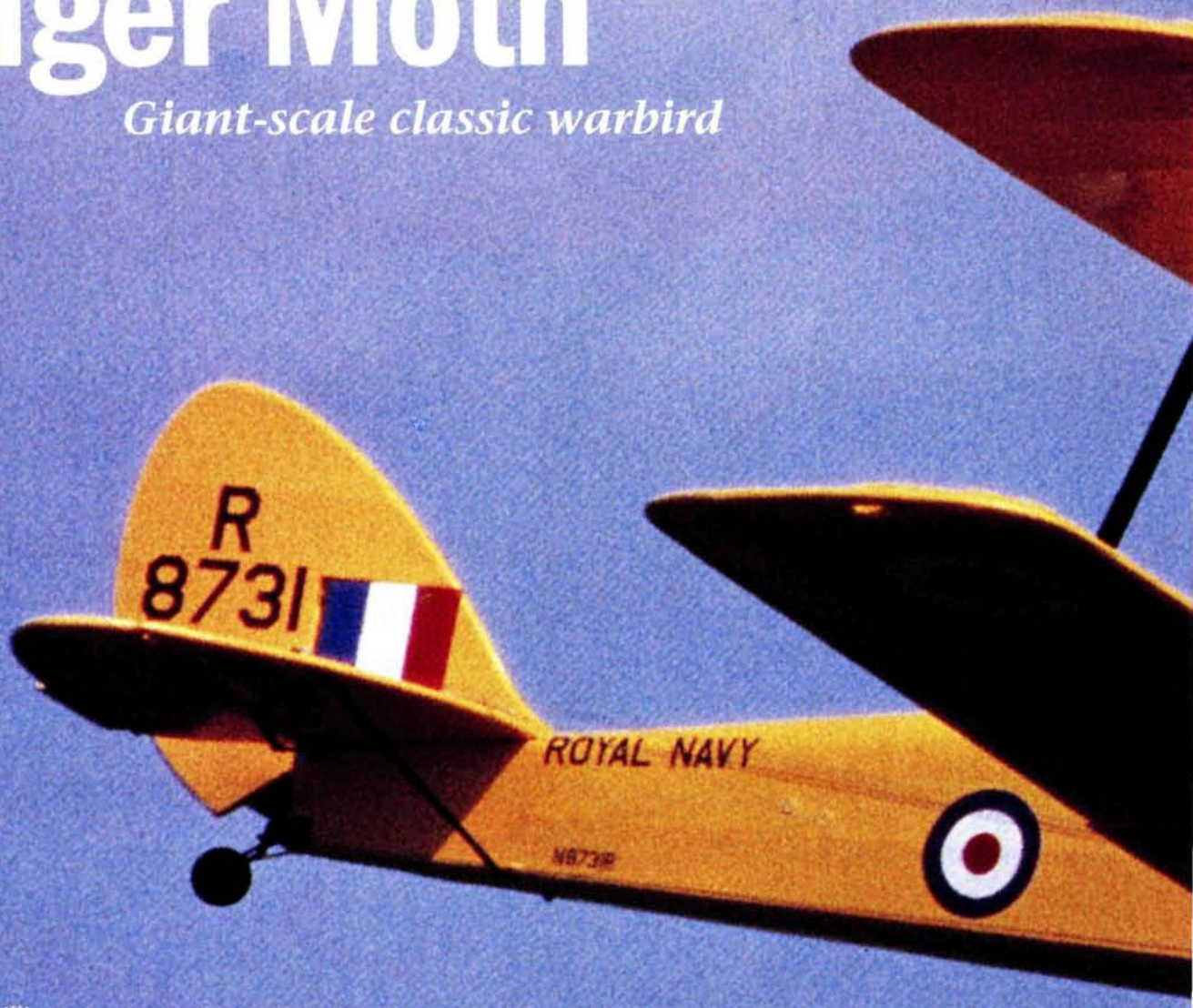
SAC Headquarters Inc. *(407) 348-0663.*

Tru-Turn; *distributed by Romco Mfg. (713) 943-1867; tru-turn.com.*

Zinger; *distributed by J&Z Products (310) 539-2313.*

Clark Industries Tiger Moth

Giant-scale classic warbird



by Sal Iasilli

In its day, the Tiger Moth was one of the most widely used trainers in the world, and it remains one of the most widely recognized. Its maiden flight took place in England, in August 1931, and it soon became the standard trainer for many flying clubs and auxiliary squadrons. With dual controls and open cockpits, it was adaptable to all branches of primary training, including aerobatics. The Tiger Moth was also very popular with private owners, and many of the planes are still in use today.

The Clark Industries Tiger Moth is a very authentic reproduction of the famous trainer. The kit consists of complete drawings that show all details of construction; an instruction manual; laser-cut parts from top-quality balsa, basswood and aircraft plywood; laser-cut metal fittings; a custom fiberglass cowl and upper center fuel-tank section; a 20x6 prop; many formed-plastic detailed parts; preformed aluminum cabane struts; 5-inch balloon wheels; steel flying wires and control cables; aluminum tubes for wing plug-ins; an engine mount; a center console and radio servo-installation module; a steerable tailwheel; instrument panels; a canopy; a fuel tank; and a complete hardware package that includes hinges, control horns and clevises.


R
8731

SPECIFICATIONS

MANUFACTURER: Clark Industries

MODEL: de Havilland DH82c Tiger Moth

DISTRIBUTOR: Sig Mfg.

TYPE: ¼-scale WW II trainer

WINGSPAN: 88 in.

WING AREA: 2,150 sq. in.

LENGTH: 71 in.

WEIGHT: 21½ lb.

WING LOADING: 21.44 to 23.57 oz./sq. ft.

ENGINE REQ'D: 1.90 to 2.70 2-stroke or 1.50 to 1.80 4-stroke

ENGINE USED: Clark Industries Gypsy Minor 32cc

RADIO REQ'D: 5-channel with 5 servos

RADIO USED: Futaba 8-channel PCM with 5 Futaba standard servos

PROP USED: Clark 20x6

FUEL USED: 25:1 gas/oil mixture

PRICE: $550 (plus S&H)

FEATURES: laser-cut balsa, plywood and metal parts; kit includes wheels, pilot bust, fuel tank, flying wires, full-size plan, scale drawings, an instruction manual, prop and a complete hardware package.

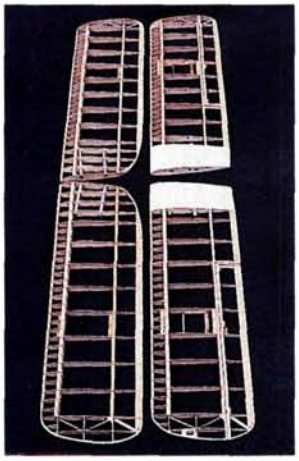
COMMENTS: the Clark Industries Tiger Moth isn't difficult to build or to fly. It's a great choice for anyone who wants to get into scale modeling.

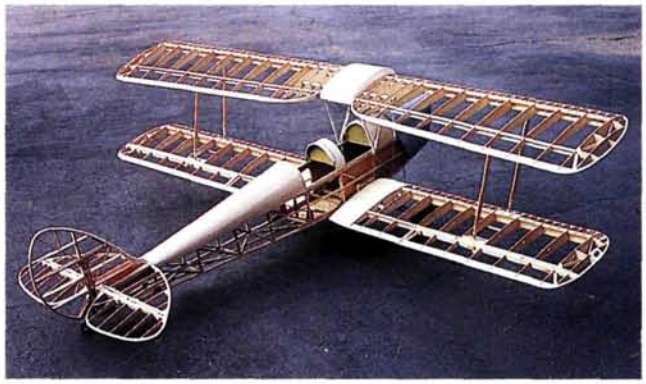
HITS

- Laser-cut parts.
- Easy-to-follow instruction manual and detailed plan.
- Accurate scale outline.

MISSES

- None.





Left: the wings are completely built up and ready to be fitted to the fuselage assembly. Above: my Tiger Moth is completely built and ready to be covered and finished.

CONSTRUCTION

Fuselage. Construction begins with the assembly of the precut, interlocking plywood bulkheads with epoxy resin. This forward assembly supports the engine, landing gear and cabane struts, so it is very important to be sure that the assembly is square before the epoxy hardens. The two fuselage side frames should be assembled directly over the plan. Use alignment jigs to align the fuselage side to the forward bulkhead assembly. Then glue the turtle-deck formers and stringers and sheet the turtle deck with 3/32-inch balsa sheeting.

The Clark Tiger Moth can be assembled in either of two versions: DH82a or DH82c. Because the Tiger Moth DH82c has a more forward landing gear (and, therefore, better landing ability) than the DH82a, I chose to follow that design. The prebent landing gear is assembled with copper wire and a good grade of soft solder and non-corrosive flux. Use the front and side views on the plan to assemble and align the gear. The instruction manual takes you through the assembly of the undercarriage step by step.

Wings and tail surfaces. Build the wing and tail surfaces directly over the plan in the same manner as the fuselage. The wingtips and tail-surface outlines are made from basswood-strip laminations and should be assembled in simple jigs as illustrated in the instruction manual. Epoxy the aluminum tubes in the wings to secure the wings to the fuselage. It's very important to follow the instruction manual when you align the wings to the fuselage.

Cables that run along the side of the fuselage to the rudder armatures control the steerable tailwheel assembly.

The fiberglass dummy fuel tank supports the upper wing and this, too, requires careful positioning before you epoxy the tubes in place. Once you've completed the wing construction, cut the ailerons free. The tail surfaces are basswood laminated to the outer frame's outline, and they should be built up in a similar manner, directly over the plan.

Covering and painting. I covered the entire airframe with Nelson Fabriclite Covering; it's a lightweight polyester material with an adhesive backing that adheres when you use a heating iron set at 200 degrees F. The material is then made taut with the heating iron set at 250 degrees F. This fabric is very easy to work with and fits nicely around compound curves. No doping is required to achieve a drum-tight finish. I then used a long needle to apply RC/56 canopy glue to simulate rib stitching. When the glue dried, I cut ½-inch strips of fabric and ironed them on over each rib.

I applied Nelson's water-based, polyurethane paint directly onto the fabric. The instructions suggest that you brush on several light coats of white paint as a base coat before applying the color. To make the paint fuelproof and the fabric more durable, I added 8 ounces of cross-link additive to 1 ounce of color. The cross-link also eliminates the need to dope the fabric before painting. It is extremely important that you strain the paint with a fine strainer, such as a nylon stocking, before use. To thin the paint, the manual suggests using one cap of water to every 4 ounces of paint.

After I had brushed on the white primer coats, I misted on several light coats of Cub Yellow. Do not spray heavy coats because you will use water to thin the paint, and a heavy coat will tend to run. Therefore, light mist coats are recommended. Another important thing to remember when you use this paint is to have a bucket of water nearby. Since the paint dries quickly, it tends to clog the spray gun. To avoid this, while waiting for each coat to

The balloon wheels and scale undercarriage absorb much of the load when landing.

FLIGHT PERFORMANCE

I set the control rates as follows: ailerons, 1½ inches up and ½ inch down; elevator, 1¼ inches up and 1¼ inches down; rudder, 2¾ inches left and right. The center of gravity is at the rear cabane struts.

For the first flight, I handed the radio off to my friend and flying buddy, Ron Weiss, so I would be free to take some flight photos. The wind speed was between 10 and 15mph.

TAKEOFFS AND LANDINGS

The recommended takeoff procedure is to hold some up-elevator and a touch of right rudder and gradually increase the throttle until flying speed is achieved. As soon as the tail comes up, release some of the up-elevator, and the Tiger Moth will be airborne before you know it. Turns are smooth and gentle, just as they would be in a large trainer. Aileron and rudder coordination is required for turning and banking. The Tiger Moth is very stable in flight and can be flown hands-off into the wind. It resembles a big, gentle kite flying on its own.

Landings are just as gentle, slow and steady as they are with the full-size Tiger Moth—a very pleasant sight.

LOW-SPEED PERFORMANCE

Slow speed is what the Tiger Moth does best. With a little headwind, it can virtually stand still. Stalls are very gentle and forgiving, and control response is constant.

HIGH-SPEED PERFORMANCE

The full-scale Tiger Moth is no speedster, and this model isn't either. Just as with the full-size plane, a dive is required to gain some airspeed, but even with this maneuver, it won't break any speed records.

AEROBATICS

Aerobatics are limited to barrel rolls, loops, split-S's, hammerheads and spins, all of which are gracefully done, almost as if in slow motion. This gives you plenty of time to recover to straight and level flight.

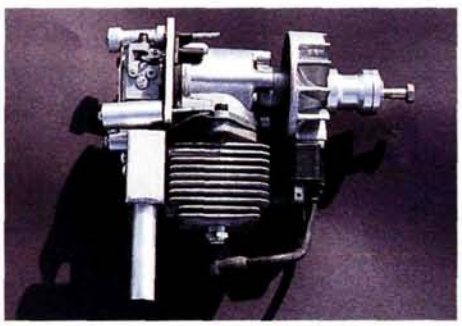
This detail photo of the tail shows the movable, scale elevator trim tabs.

cure (10 to 20 minutes depending on the temperature) remove the paint cup from the sprayer and submerge the entire gun in water. This prevents the internal parts of the gun from clogging. There are some advantages, however, to using this type of paint: it is non-toxic, virtually odorless and can easily be cleaned up with soap and water. If you want to paint your model in true-scale RAF camouflage colors, Clark Industries has a new line of custom-mixed acrylic enamel paints available. Check the company's website.

Radio installation. I installed standard Futaba servos in each lower wing panel for the ailerons and mounted the same servos in a center console for the elevator, rudder and throttle linkages. I made the center console from precut plywood and mounted it in the center of the fuselage. To conceal the radio gear, I mounted the pilot seats directly over the console, and the battery pack and receiver were mounted behind the rear seat. I used Robart control horns for the ailerons and Robart hinge points for the control surfaces; they are very close to scale in both appearance and function. Pull/pull cables were used for the elevator and rudder, as shown on the plan.

Final assembly. The recommended engine for the Tiger Moth is the Clark Industries Gypsy Minor. At 32cc, this little powerhouse will swing a 20x6 prop at 6,500rpm and fly the Tiger Moth at scale speed. The engine also fits nicely in the cowl, and because the carburetor is mounted behind the engine, no holes have to be cut. Rather than use the non-scale, steel flying wires provided with the kit, I attached Nelson Hobby Specialties airfoil-shaped, steel flying wires and clevises. They more closely resemble the equipment used on the full-size Tiger Moth.

Scale detailing. This particular Tiger Moth was modeled after the one flown for more than 30 years by Richard King at the Old Rhinebeck Aerodrome. All the graphics on my model, including the roundels, were computer cut at Vinylwrite Custom Lettering, and I used a pilot figure from Clark Industries. This pilot is not only realistic looking, but its head also moves from side to side. I fabricated the two instrument panels using the patterns provided in the kit *Editor's note: the Tiger Moth now comes with resin-cast instrument panels.* Including the placards and warning labels, all instruments came from Nelson decal sheets.



The Clark Industries Gypsy Minor 32cc engine is ideal for the Tiger Moth. Because the carburetor and muffler are at the rear of the engine, you do not have to cut holes in the cowl for it to fit perfectly.

FINAL THOUGHTS

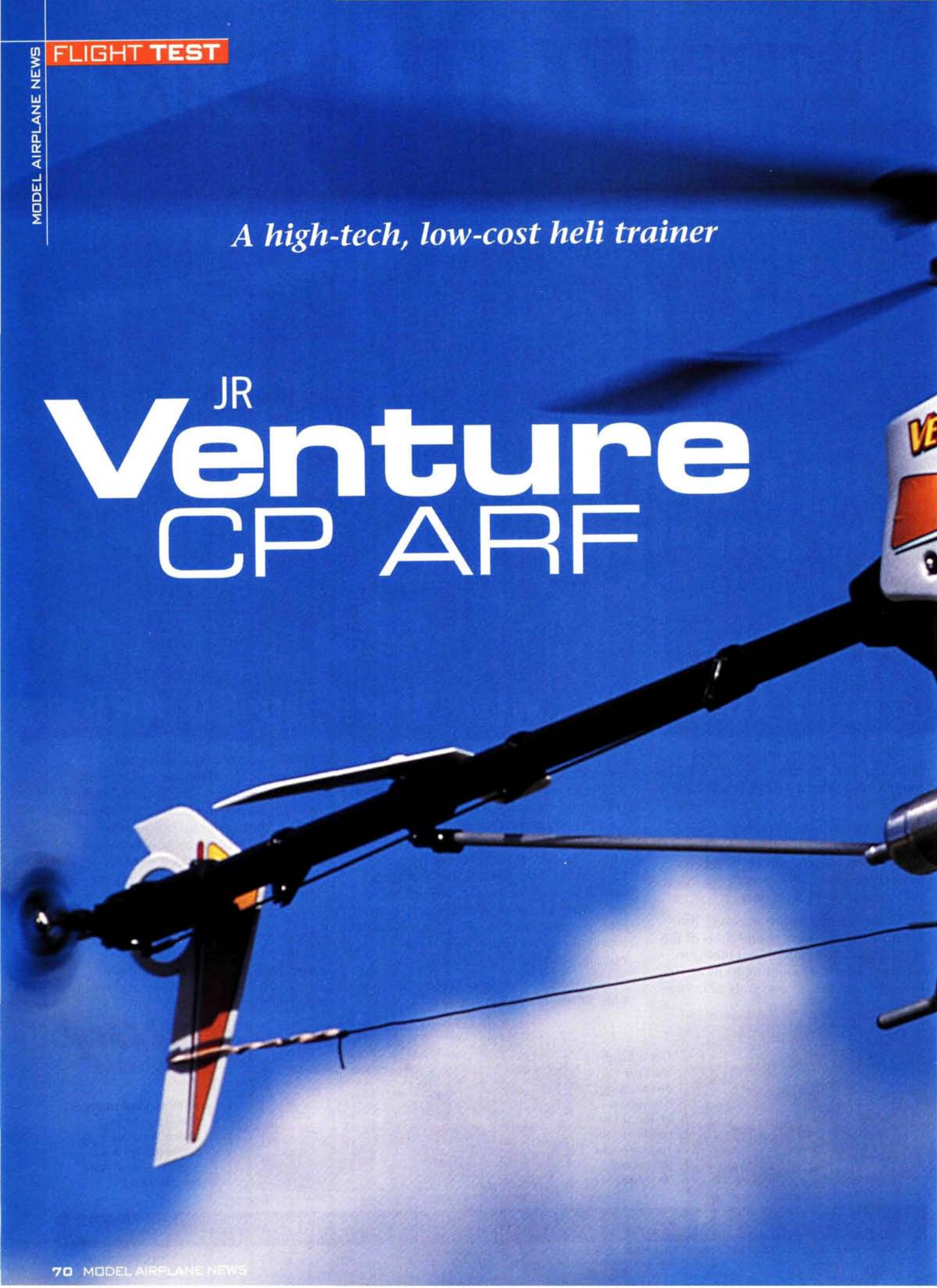
The Clark Industries Tiger Moth kit was a pleasure both to build and fly. It would be a great addition to anyone's model collection, especially those who favor vintage scale biplanes. My Tiger Moth earned first place in the static display at the 2002 Westchester Radio Aero Modelers Show. It was quite a compliment to hear Bill King, Richard's brother and former part owner of the full-size Tiger Moth that I modeled it after, cheer for me when I accepted my award.

A top view of the cockpit detail. The Clark Industries pilot figure adds a great deal of character to the cockpit.

Clark Industries (905) 936-2131; clarkindustries.on.ca.
Futaba; distributed by Great Planes Model Distributors Co. (800) 637-7660; greatplanes.com.
Nelson Hobby Specialties (877) 263-5766; nelsonhobby.com.
Robart Mfg. (630) 584-7616; robart.com.
Vinylwrite Custom Lettering; (707) 259-1280.

A high-tech, low-cost heli trainer

JR Venture CP ARF



by Matt Boyd

OK, I'll admit it: when this project started, I knew precious little about RC helicopters. Sure, I knew about the basic layout and the parts required, and I understood the basic physics involved. I'd seen helis flown by others, and I'd even spent several hours on the new Ikarus Aerofly RC flight simulator trying to get an idea of heli flight characteristics. But to say that I know how they fly based on that is like saying I know what a hamburger tastes like because I've seen a McDonald's commercial.

The JR Venture CP was the ideal choice for my first taste of RC helicoptering. It is almost ready to fly (ARF), so the major assembly has already been completed for you. *Model Airplane News* associate editor, resident heli guru and my flight instructor for this enterprise, Rick Bell, assures me that it is among the easiest to assemble glow-powered helis on the market. It is .30-size, so it is big enough to be stable but not so big that it is difficult to build or transport. It is also remarkably affordable, considering its level of quality and completeness. So, with the proper equipment, it was time to see whether I could master the art of helicopter flight.

WHAT YOU GET

Pop open the box, and the Venture already looks like a helicopter! This is both gratifying and a little misleading. It is an ARF, so the major components come bolted together; but there are still a few hours' worth of minor assembly and adjustments to complete. The main rotor head has been assembled and installed in the chassis, as has the drive train. The landing gear is already mounted, as are the flybar and the fuel tank. The tail rotor assembly is also built, and though you must connect the tail boom to the chassis (it wouldn't have fit in the box otherwise), this is quite easy to do. The manual contains

PHOTOS BY WALTER SIDAS

SPECIFICATIONS

MODEL: Venture CP ARF

MANUFACTURER: JR

DISTRIBUTOR: Horizon

MAIN ROTOR DIAMETER: 48.70 in.

LENGTH: 43.90 in.

RADIO USED: JR XP662

ENGINE USED: Webra Speed .35 Heli

GYRO USED: JR G460T Sport Tail Lock

FUEL USED: Morgan 30-percent Heli fuel

STREET PRICE: $269.99

FEATURES: cyclic, collective pitch mixing (CCPM), ball-bearing-equipped rotor head, hardware included, beginner and advanced flybars, almost ready to fly—major assembly is complete, decals and detailed manual with radio-programming instructions included.

COMMENTS: the level of assembly completed by the factory is impressive. Engine and radio gear installation is simple, and just about all the hardware you'll need is included and sorted. The manual provides lots of detail on control setup, though the programming instructions could be better. Overall, the Venture is a good introduction to RC helicoptering, while still providing lots of content and upgrade potential for more experienced fliers.

HITS

- Strong value.
- Relatively little assembly required.
- CCPM and ball-bearing rotor head in a beginner heli.
- Wide performance envelope—beginner to advanced.

MISSES

- Blades were out of balance.
- Programming instructions did not match the radio.

detailed instructions, diagrams and photos that will walk you through the assembly.

The rotor head is especially impressive because it features 120-degree cyclic/collective/pitch mixing (CCPM). In a nutshell, this allows each of the rotor head's three directional movements to be actuated by multiple servos instead of by just one. There are two advantages to this; first is a much simplified linkage system. Second, because there are fewer joints and bends in the linkage, and because each motion is driven by the strength of more than one servo, CCPM produces more precise control movements. This is a really nice feature for a relatively inexpensive heli, and it gives the Venture a lot of performance hop-up potential down the line (see Rick Bell's sidebar "Upgrading the Venture").

The Venture actually looks like a heli as it comes out of the box. Aside from the tail boom, all the major assembly is complete.

The manual also lists the items you'll need to complete the Venture; these include a .32 to .38ci heli engine with muffler, a 6-channel radio with 120-degree CCPM function, five servos and a gyro. Also required is a host of basic assembly and field equipment that most modelers already have, along with a few heli-specific items (e.g., a blade balancer, a pitch gauge, etc.) that you probably don't have unless you're already a heli owner.

ASSEMBLY

Assembling the Venture is fairly easy, though it is time-consuming—especially if, like me, this is your first heli. Quite a bit of fine-tuning is necessary; proper centering, alignment and travel of all of a helicopter's moving parts are essential—much more so than in any other sort of RC vehicle. With an airplane (especially a trainer type) you can get away with "close enough" on some things; but with a heli, everything has to be dead-on, or the aircraft can become extremely difficult to control.

Start with the tail boom; attach it with four bolts and two setscrews after you've made sure that you have the proper belt tension. Too loose, and it may pop off the drive gear; too tight, and it may cause binding and wear. Next, bolt on your tail fins and tail control-rod guides. The guides are clamped onto the tail boom and the round bushings on the rod itself. You'll need to move the guides back and forth and around the boom to get the rod to slide smoothly. At Rick's suggestion, I put a shallow Z-bend in the rod between the third guide and the chassis; this greatly reduced tension on the rod.

Next is the engine. I opted for the recommended Webra Speed .35 Heli engine. It was broken in on the bench and then installed with the included engine mount. The engine is oriented so the head points aft, and this makes the glow plug fairly easy to access through the rear of the chassis. Attaching the cooling fan and clutch assemblies is pretty straightforward and well documented, but the orientation of the engine mount can be tough to determine from the diagram; be sure to note the addendum to the manual inside the front cover. Now it's time to bolt on the muffler; I used the stock JR .32 to .36 muffler. The chassis's bottom rail partially obscures the lower mounting-bolt location, so it takes a bit of wrestling to get it on. Then, connect your fuel and pressure lines, and you're ready for the radio gear.

Radio gear. You'll need five servos, all of which are installed using the supplied self-tapping 12mm screws and washers. The screws are threaded into soft-plastic mounting tabs on the chassis. Rick used longer screws to attach his servos, and I plan to do so as well, as an added safety measure.

The rotor head features 120-degree cyclic/collective pitch mixing (CCPM) and ball bearings all around. This is a great feature considering the Venture's low cost.

UPGRADING THE VENTURE

Could a low-cost, entry-level heli be transformed into an aerobatic trainer just by changing a few parts and some program parameters? That's what I wanted to find out. I started by using the same equipment and basic setup as Matt's and first flew the heli as a beginner would. It definitely is a docile heli to learn to fly with. After flying the heli through several tanks of fuel, it was time to make a few changes, as recommended in the manual for aerobatics. Here's what I did and how it turned out.

My first change was to replace the trainer flybar and paddles with the supplied aerobatic flybar and paddles. The flybar differs in that it's shorter (410mm) than the factory-installed 540mm flybar; a shorter flybar means quicker control response. The second set of paddles has a thinner airfoil and is lighter than the beginner paddles; these also provide the quicker control response needed for aerobatics.

Changing the flybar is simply a matter of removing one of the paddles, loosening the setscrews in the seesaw assembly and then sliding the flybar out. The shorter flybar is now installed with the aerobatic paddles; this took me about 20 minutes. I next changed the pitch and throttle curves to accommodate basic aerobatics, and I used my JR 10X heli radio for this. Although the JR XP662 radio offers features for both the new and the sport pilot, I was going to really wring out the Venture and needed more programming capabilities further into the testing. I left everything else on the heli as it was.

The first flight was quite surprising. Using the recommended values in the manual, I found that the Venture performed basic aerobatics such as loops, rolls and stall turns without a lot of fuss. The heli had a very nice feel to it. It would be great to learn to do fundamental aerobatics with it.

To further increase the Venture's performance capabilities, I changed the main rotor blades and the muffler. Though the stock wooden rotor blades work well, I decided to use NHP Razor Pro Symmetrical 550mm carbon-fiber blades that have a thinner airfoil and are a lot stiffer. The thinner airfoil allows the engine to turn the blades with less effort; this translates to more head speed and they also respond quicker to control inputs. I changed the muffler to a K&S 46C competition muffler. This large-volume muffler allows the engine to breathe easier and develop more torque. I also set up a 3D aerobatic program in the radio.

At first liftoff, I could tell that the Venture had been transformed into an agile performer. Its cyclic response was crisp without being twitchy, and full power climb-outs were lively. I tried some loops and rolls that were easy to do. I next did some flips, tumbles and inverted hovering, which the Venture handled well, although I could tell that some tweaking of the throttle and pitch curves would further improve its performance. Overall, the model's cyclic power and response are more than adequate for aerobatics.

I think JR hit the mark with the Venture 30CP. It's easy to assemble, comes with an aerobatic flybar and paddles and is docile for the beginner, and it can be transformed into an aerobatic 3D trainer. So whether you're new to helicopters and looking for a place to start or a seasoned pilot who wants a low-cost heli to learn to fly new maneuvers with, the Venture is hard to beat. *—Rick Bell*

The receiver, gyro and battery pack are all very simple to install. The large, flat space just in front of the elevator arm linkage is perfect for the gyro. Make sure it is flat and straight, and then attach it with the foam mounting tape that comes with your gyro. I used JR's G460T piezo gyro. Wrap your receiver and battery in foam rubber to isolate them from vibration, and install them in the nose. The diagram shows the receiver on top and the battery pack on the shelf underneath, but I swapped these around. With the receiver on the shelf, it holds all the servo wiring neatly inside the chassis. The switch can be a little tricky to install, as no screws are provided and the ones that come with the radio are much too short.

Programming. Programming an airplane's radio wouldn't warrant its own step in the assembly, but with the Venture, programming takes up 15 pages of the manual and a significant portion of the setup time. The first step is to activate the radio's CCPM function. The manual describes the process for several popular JR radios, including the XP662, but I found the instructions difficult to follow, and they did not always correspond to the XP662's controls. That this was my first exposure to the XP662 certainly didn't help matters, but after much trial and error, I figured it out.

A much easier—but no less important—step is to make sure that all your

TAKING IT FOR A SPIN

My first impression of attempting to hover the Venture was roughly akin to riding a unicycle while drunk. The world kept rolling out from under me as I tried to maintain a level attitude. I

would have sworn that I had messed up the setup, if Rick hadn't hovered the heli just seconds earlier. He subtly reminded me of the two most important things to remember when learning to fly: keep the inputs small, and keep your eye on the disc—not the tail. Slowly, these two commandments became more reflexive, and I began to get the hang of it. It still felt slippery, but I was surprised at how directly the Venture responds to individual control inputs.

I concentrated on maintaining position and heading just a few inches off the ground, experimenting with the pitch and roll movements generated by moving the cyclic. Periodically, it got away from me, at which point I yanked back on the collective to settle it back down on the ground. Once I established that I could effectively calm it down with that one simple movement, I felt a lot more confident about manipulating the cyclic.

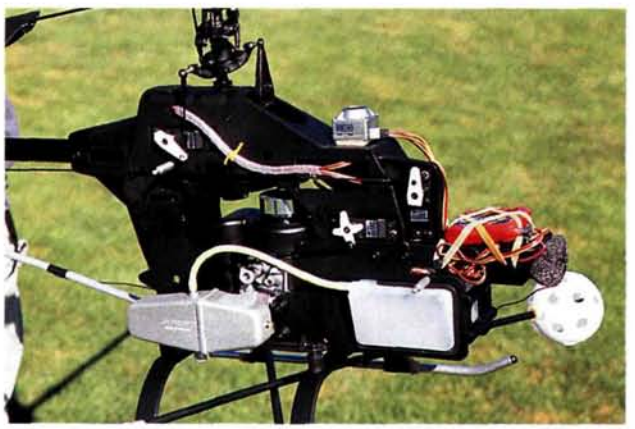
I also experienced for the first time the phenomenon known as ground effect. That can be disconcerting, as the heli seems to react differently every second to the air rebounding off the ground. Sometimes it slips to one side or the other, sometimes forward or aft. Sometimes it seems just to gain lift and rise straight up, and because the effect is created by plain old air, you can't see it until it happens.

One big help is the heading-lock gyro, and I noticed a big difference when it was engaged. It holds the tail steady, and that allowed me to concentrate on the cyclic without having to worry about inadvertent rotation due to weathervaning or ground effect. When you first lift off, the gyro hunts around a little and you may have to make a rudder correction, but after that, the heli holds a heading very consistently.

I can only judge the Venture's flight performance in terms of a rank beginner, and in that sense, it feels pretty good. It does what I tell it to do in a deliberate, direct and predictable way. It's still plenty spooky when it does something I didn't tell it to do, but it consistently recovers—as long as I give it the proper instructions. That is the biggest difference between a trainer airplane and a trainer heli: a heli doesn't correct itself when you back off the sticks. I have a feeling that is something I'll be getting used to for a long time.

servos are centered exactly where they are supposed to be when the collective stick (throttle) is in the center position. You'll need the radio's subtrims to get this just right. Likewise, you need to make sure that the swashplate is flat, level and centered across all three dimensions and that your control rods are precisely the right length to produce balanced movements.

Finishing touches. Once you have the controls dialed in, all that's left is to dress up the Venture and make sure everything is balanced. You need to trim the windshield and install it using six self-tapping screws; then place your decals. This takes time, though it wasn't a big deal. What is a big deal is making sure that your rotor blades are balanced. With the rotor spinning up to 1,800rpm, even a slight imbalance can have your Venture shimmying all over the field and can lead to mechanical failure. My blades were way off, so I passed them along to Rick to balance on his KS&J Universal Blade Balancer.



Left: here's a look at the Venture's chassis. There is a flat space just in front of the elevator arm for mounting the gyro, and the two-shelf platform in the nose holds the receiver and battery. I opted to place the receiver on the lower shelf so that the radio wires would stay neatly tucked inside the chassis. Above: the tail rotor comes fully assembled and mounted on the tail boom. All you have to do is connect the drive belt, mount the boom to the chassis and connect the supplied control rod.

When the Venture looks the part and can spin its blades without excessive vibration, it's time to pack up your support equipment and head for the field.

FINAL THOUGHTS

Before I started with the JR Venture CP, I knew next to nothing about what it really takes to fly an RC heli. Now that I've tried the Venture, I know a little about what it takes. Geared toward convenience, performance and affordability, the Venture is among the best helicopters out there for beginners. That is not to say that it's easy to set up or to fly, at least by airplane standards. But therein lies the challenge and the appeal of an RC helicopter; even a relatively simple heli is an engaging technical exercise, and the amount of precision, preparation and patience it requires surpasses that of many model airplanes. When, at last, you start to get it, though, you'll feel a sense of accomplishment that is difficult to match with any model type. If you've ever wanted to try RC helicoptering and are up to the challenge, JR's Venture CP is the place to start. ✚

Horizon Hobby Inc. *(800) 338-4639; horizonhobby.com.*
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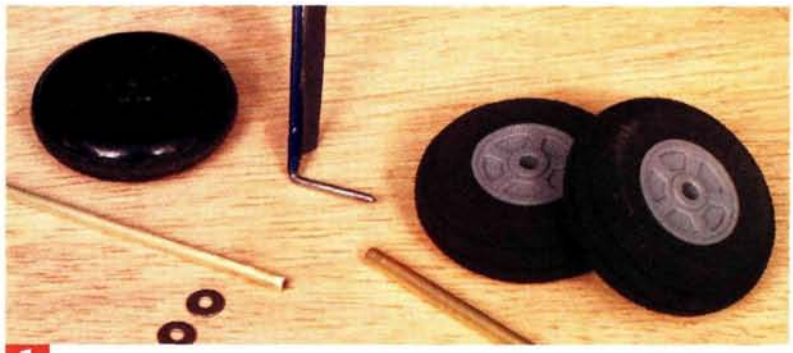
Easy wheel installation

Lightweight fix for small models

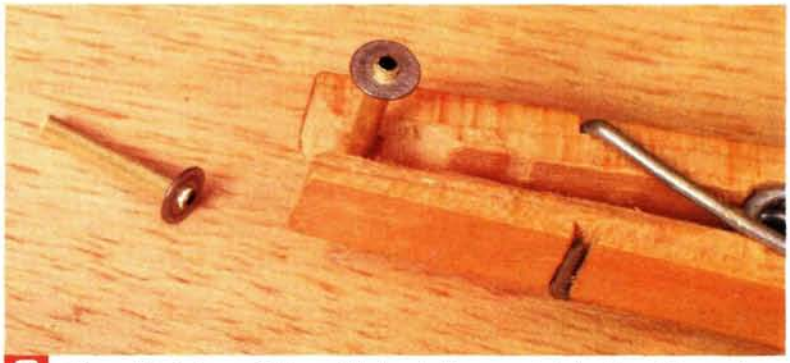
by Thayer Syme

Securely attaching wheels to models has been a hassle since our creations first took to the skies. Wire landing gear works well to support models, but ensuring that the wheels stay attached can often be tricky. The standard technique is to use just a plated brass wheel collar with a setscrew. Although this works well enough for larger models, many of us would prefer not to add an unsightly blob of metal to our smaller models. Scale models can also benefit from a low-profile installation. Soldering washers to the axle works well and is also a traditional alternative that looks better and weighs less. No solution is perfect though; you can accidentally soften modern plastic-hub wheels when you solder on a retainer. The technique I describe is based on soldering washers, but it eliminates the risk of melting a plastic hub. Note that it is a semipermanent solution to this age-old problem.

This technique and an alternative I also describe take advantage of how the wheel-hub holes on smaller models are usually oversize. I had an 1/8-inch-diameter hole in the wheel hub and a 1/16-inch-diameter gear leg. The usual solution to this mismatch is to shim the axle with one or two short pieces of tube. You could alternatively enlarge the wheel-hub hole with a drill bit. I used my Herr Mini Sport as the primary example for this article. The kit includes hard, injection-molded wheels, but I didn't like either the way the Mini Sport sounded during takeoffs and landings on a paved surface or the shock transfer that resulted from having hard wheels on stiff gear. I decided to change the wheels to the softer Dave Brown Lite Foam wheels. Because the 1/8-inch hole in the wheel hub was significantly larger than the 1/16-inch wire landing gear leg, I also took the opportunity to change to a soldered washer keeper. I will let the photos tell the story from here.



1 The supplies needed for this project. Left: one of the original plastic wheels; right: the two new foam wheels. In front of the axle are 3/32- and 1/8-inch-diameter brass tubes for the shims (you might need only one size). The washers should be brass or another easily soldered metal.

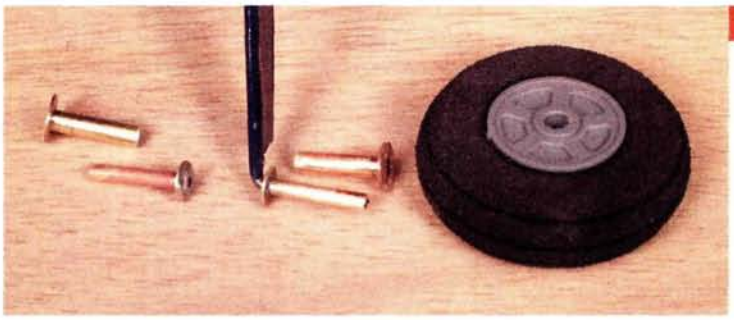


2 After cutting pieces of tube a little longer than needed, I soldered the washers onto the ends. I made washers out of thin brass shim stock; buying brass washers would have spared me this shaping effort, but it took only a few minutes to make each one.

3 One completed shim and the tube and brass strip parts for another. The finished large shim should be slightly longer than the hub thickness to prevent the wheels from binding during the final assembly.

4 After soldering the strip to the tube, I roughly trimmed it with metal snips.

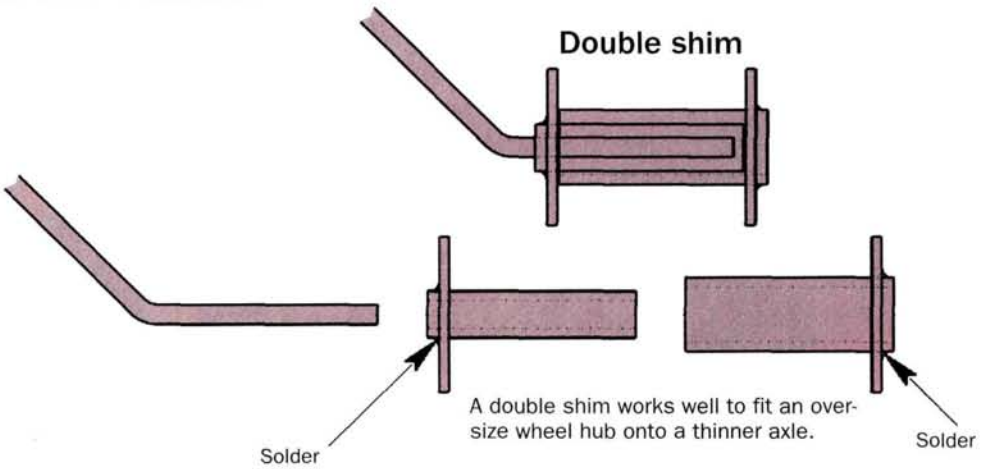
5 It is easy to shape a washer by chucking the tube in an electric drill and then using a file or sanding block to round the washer off. You can use a Moto-Tool for shaping as well, but please leave the tube and rough washer in the much slower electric drill, and use the Moto-Tool only for shaping. Again, washers that you can solder are best, if you have them.

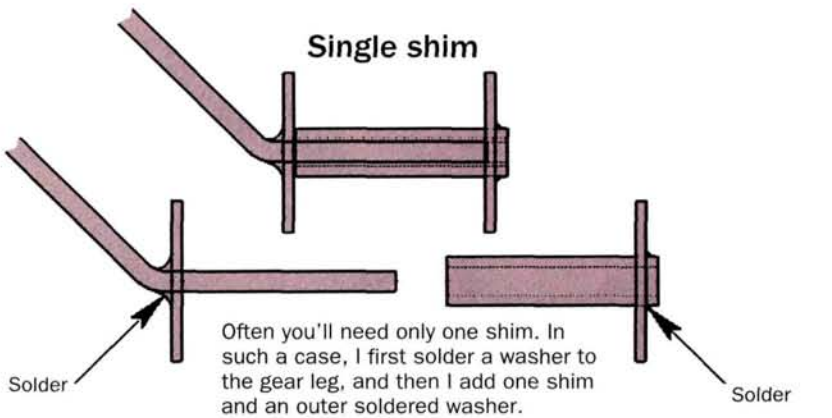


6 The four finished shims; one is being trial-fit on the axle. Glue the shims to the axle with CA. The large surface area of the bond ensures secure gluing without the heat of the soldering iron. Glue the smaller shim with the inner washer in place first. If you need only one shim, solder the inner washer directly onto the axle. When you are ready to install the wheel, slide the shim with the outer washer into the hub and gently slide it onto the axle. A small drop of CA will wick into the joint and bond securely. Be careful not to glue the wheel to the shim. A thin smear of petroleum jelly on the outside of the largest shim will help you to avoid gluing the wheel into place. I usually apply the glue to the inside of the shim from the washer side, and I work everything into place quickly before it sets.

7 Here's what an installed pair of shims looks like without the wheel in place. Do not glue the shims into place when you fit them like this! You still have to install a wheel.

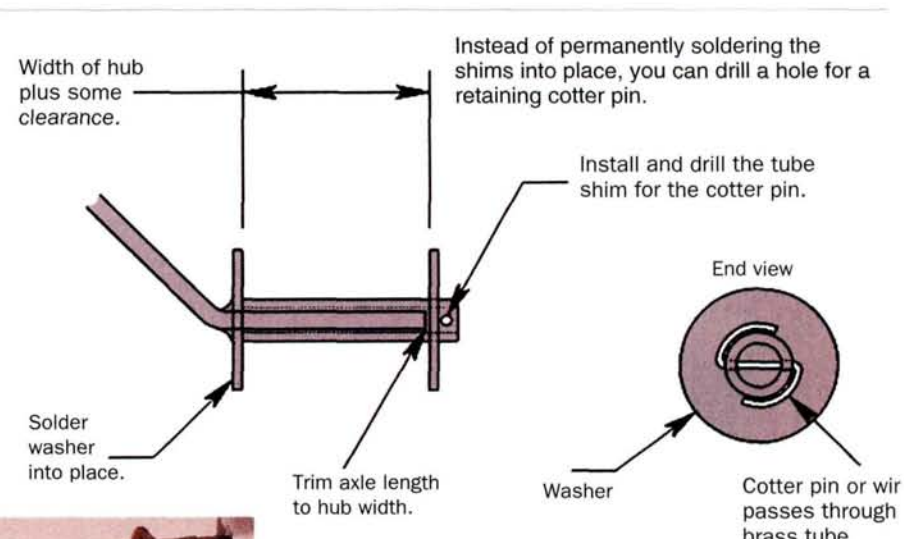
8 *Notice how neat the final low-profile* installation looks. The wheels are secure, and the MiniSport now lands quietly and with less shock. As you can see, these techniques offer a secure mounting with a very low-profile retainer. I have yet to have a wheel installed with either of these methods come off during normal operations.





Removable?

One disadvantage of this technique is that the installed wheels are difficult to remove. If you want to be able to remove your wheels, use a removable cotter pin or a retaining wire to hold the outer washer in place. After soldering the inner washer into place on the axle, cut off the axle so that it is about the same length as the hub width. Now cut and solder into place the tube shim so that it protrudes about an 1/8 inch beyond the hub. Slide a washer into place, and mark the tube for a cotter-pin or retaining-wire hole on the outer side of the washer. Drill a small hole at your mark. Install the wheel and slide the washer into place, then install the wire cotter pin to hold everything in. I have used a single strand of solid-core telephone wire on models as large as a 4-pound scale biplane.



Here is an axle shim soldered into place and drilled for a locking wire. The washer on the left is not attached.

Dave Brown Products (513) 738-1576; dbproducts.com.

Herr Engineering; distributed by Sig Mfg. Co. Inc. (800) 247-5008; sigmfg.com. ✦

CONSTRUCTION

A sport-scale Belgian light plane

The Tipsy Junior makes a great model to compete with at scale events. Its simple lines and attractive paint scheme make it a simple project.

Tipsy Junior

by Phillip Kent

In 1948, Avions Fairey of Belgium built two examples of the Tipsy Junior. The first was fitted with a 60hp Walter Mikron engine; the second was fitted with a 36hp, horizontally opposed, twin-cylinder engine. In 1948, the second Tipsy was sent to the UK, and its engine was replaced with a 60hp engine. In 1973, a bubble canopy was fitted to the aircraft, and in 1994, the plane was painted in a camouflage color scheme.

The full-size Tipsy's construction is very similar to a model with a box fuselage and semicircular formers and stringers fitted to the top and bottom to fill out the shape. The trailing edge of the one-piece wing has a slight forward taper, and the substantial main spar and plywood-covered leading edge form a rigid D-tube section. Construction of the vertical fin, rudder, horizontal stabilizer and elevators is similar to that of the wing but uses only a single spar.

The Tipsy has a wingspan of 22 feet, 8 inches, with a fuselage length of 18 feet, 6 inches. Its maximum speed was 108mph, and it stalled at 40mph. I felt that these attributes would make a wonderful scale model, and I wasn't disappointed!

My 1/5-scale Tipsy Junior has a 56½-inch wingspan, and this makes it ideal for a small, 4-stroke engine; there's plenty of room within the cowl to conceal the engine. I used a Laser .50 in the prototype model, but any similarly sized 4-stroke engine can be used.

SPECIFICATIONS

MODEL: Tipsy Junior

TYPE: sport-scale

WINGSPAN: 56.5 in.

WING AREA: 735 sq. in.

WEIGHT: 5 lb.

WING LOADING: 16 oz./sq. ft.

ENGINE REQ'D: .40 to .50 4-stroke

ENGINE USED: Laser .50 4-stroke

RADIO REQ'D: 4-channel w/5 servos (rudder, elevator, 2 ailerons, throttle)

COMMENTS: designed by Phillip Kent, the Tipsy Junior is a model of a Belgian light plane. It's easy to build and fly and can perform mild aerobatics. The model uses traditional balsa and plywood construction and is fabric covered.

CONSTRUCTION

The relatively simple box fuselage is built of 3/16-inch-square sticks with formers and stringers added top and bottom. The engine is supported by beech hardwood bearers. The wing has top and bottom shear-webbed spars at the front and rear. The leading-edge sheeting and the shear webs are 1/16-inch balsa. The stabilizer and vertical fin are built over the plan, and the elevators and rudder use the sheet-core method of construction. This model is easy to build; no difficult construction techniques are involved.

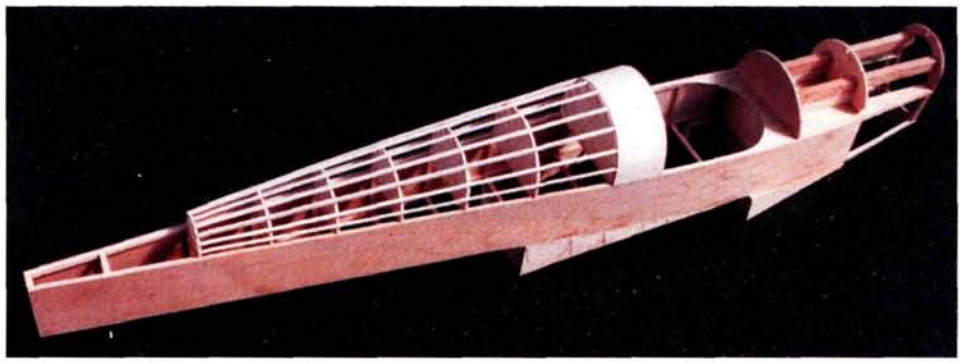
Gather all of the materials you'll need before you build the model; it saves time in the long run. Make sure that you have plenty of balsa, ply and spruce. I like to cut out all the parts to make a semi-kit of the model before I start.

FUSELAGE

Build the fuselage sides first using 3/16-inch hard balsa sticks to form the longerons and verticals. Before you pin the parts down, lay a piece of wax paper over the fuselage plan. Fit the longerons and uprights into place and glue them together. Remove the pins, but do not lift the framework from the plan just yet. Place wax paper over the frame and build the second fuselage side directly over the first. This method of construction ensures that the fuselage sides will be identical. When the glue has completely dried, remove both sides from the building board.

Position the 1/32-inch plywood plate F-20 on the plan, and fit the bottom part of formers F-2 and F-3 into place; make sure that they are vertical. Glue the fuselage sides into place after you insert a 1/32-inch shim at the stern post and then add the balsa crosspieces. The top cockpit opening spacer can be cut away later, after the fuselage has been completed. Add former F-1 before you cover the sides of the fuselage with 1/32-inch plywood.

Glue into place the 3/16-inch balsa wing mount, the half-round bottom formers and then the bottom fuselage stringers. Add the top decking formers as well as the maple engine bearers; use epoxy to glue the bearers into place. Add the top stringers and the 3/32-inch balsa planking. Set the fuselage aside, and build the wing next; it will be needed to complete the fuselage.



Above: the fuselage may look difficult to build, but it's really just a box. Formers and stringers are added top and bottom to give the fuselage its graceful shape. Below: here, the bottom of the fuselage is ready for the formers.

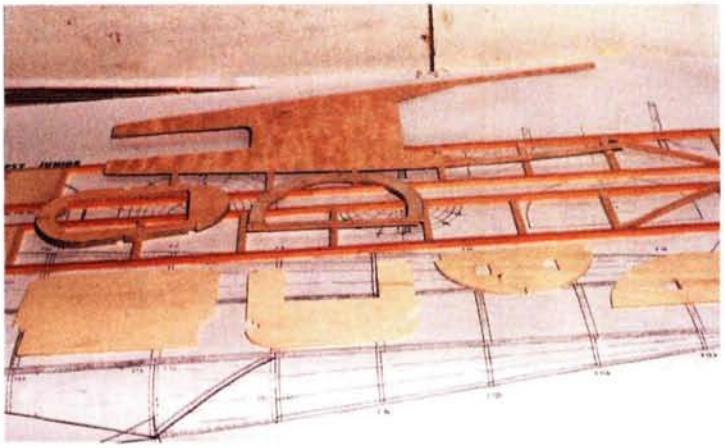
FLIGHT PERFORMANCE

I had no problems flying the prototype model. It has no bad characteristics and makes an excellent scale model for those who want to enter the sport-scale competition scene. Although not classified as an aerobatic aircraft, the model will perform maneuvers such as stall turns, wingovers, loops and rolls. Speed needs to be built up in a dive before a loop, but otherwise, it needs no special handling. The model is at its best, however, performing realistic low flybys and other similar maneuvers. The model has had a successful flying career thus far. It has competed in several UK stand-off-scale events; it placed second at the Woodvale International Rally and second in the Traplet Trophy event at Barkston Heath.

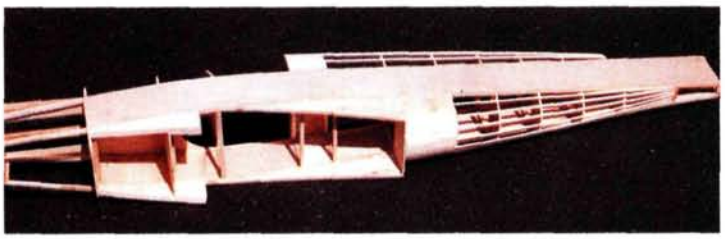
The wing uses traditional construction methods and has main and rear spars. For strength, the spars are shear webbed with vertical-grain balsa. The ailerons are part of the wing but are later cut free and finished. Note the shim stick that supports the trailing edge of the ribs and sets the correct washout.

WING

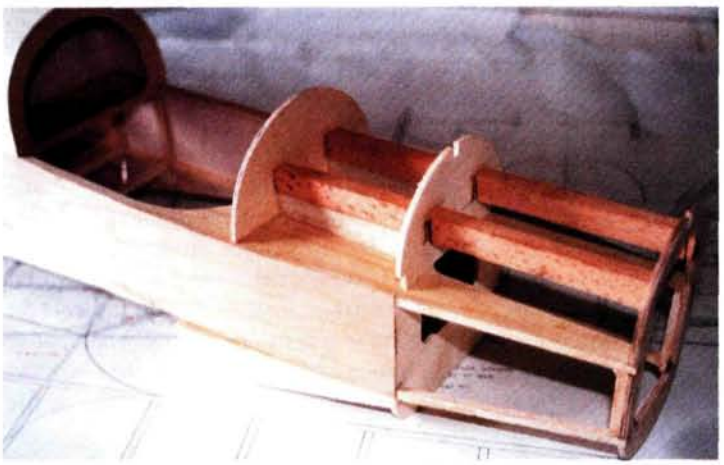
Make a plywood template for the root rib, and cut the ribs from 3/32-inch balsa. Trim two of the ribs to make the tip ribs. Stack half of the ribs together between the root and a tip rib and then shape the



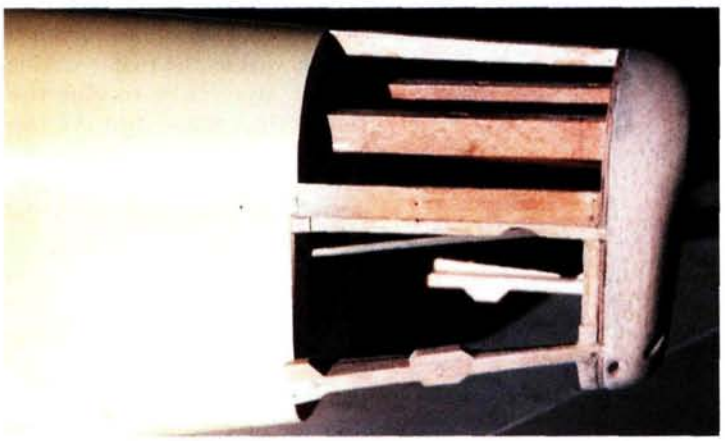
If you scratch-build from a plan, it's best to make a kit of sorts before you begin building. Having all the materials on hand makes building the model go smoothly.



The fuselage is ready to have the wing mounted to it. If you look closely, you can see the box structure that forms the basic fuselage.



The engine bearers are built into the front of the fuselage and provide a lot of strength.



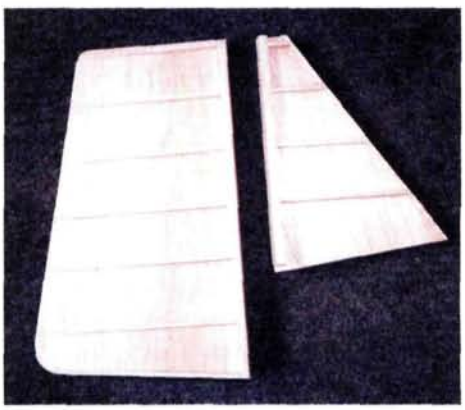
The nose of the cowl is shaped from a block of balsa, while the sides, top and bottom are made from thin litho-plate. All four sections are held in place with screws. As you can see, there's plenty of access.

underside of the ribs evenly to the tip. Repeat this process to make a second set of ribs.

Build the wing with the front bottom 3/16-inch spar pinned flat on the building board. Use a long balsa stick to shim up the trailing edge 5/8 inch at the root and 3/4 inch at the tip, and fit the ribs into their correct positions. After you remove the panel from the building board, save the stick; you'll need it later when you add the rear shear webs. Note that the root rib needs to be angled for the dihedral (see the plan for details). The cutout for the fuselage in the wing's front center section should be made after the wing panels have been joined.

Glue the false leading edge and top spars to the ribs, and then glue the shear web to the front spars; the web grain should be vertical. Remove the panel from the board and add the rear bottom spar. Build the second wing panel to the same stage and then join them with the plywood dihedral braces and epoxy. Place the balsa shim stick between one wing panel and the building board. Glue the rear shear webbing (vertical grain) into place followed by the aileron spars and the top leading-edge sheeting. Repeat for the other wing panel. Now add the center-section sheeting, the trailing-edge cap and the rib capstrips. At this time, the capstrips stop at the ailerons. Cut the ailerons away from the wing, and fill the space between the spars with 3/16-inch balsa. Trim the aileron ribs to size and add the front aileron spar. Add the remaining capstrips and sheeting to the top of the wing. Fit the hardwood landing-gear mounting blocks before you sheet the bottom of the wing.

Glue the balsa leading edge to the false leading edge and then add the balsa wingtip blocks. Carve, shape and sand the leading edge and wingtips. Add the aileron hinges and control horns, but don't secure the hinges until after you've covered the model. I made my control horns from printed circuit board (with the copper removed). You can also use commercially available horns. Now that the wing is completed, let's finish the fuselage.



The vertical fin and rudder are built using a core sheet and ribs; they are assembled flat on the building board.

FINAL CONSTRUCTION AND TAIL SURFACES

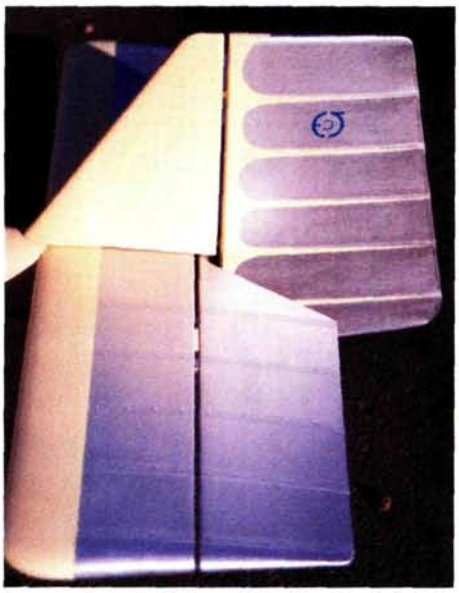
Use balsa blocks to build up the fuselage forward of the wing saddle. Note that there are two 3/16-inch sheet pieces above the bottom block. Do not carve the blocks until the wing has been fitted. Fit the plywood wing-mounting plate between formers 6 and 7 so that the wing can be bolted into place. I used an aluminum peg fitted in the leading edge of the wing as an alignment pin. Fit the wing into place, then shape the fuselage bottom.

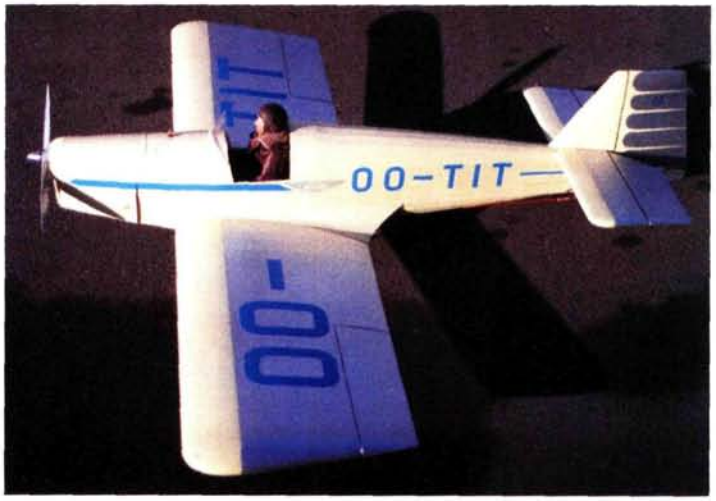
The rudder and elevator halves use 1/16-inch balsa core sheets with spars and ribs added on each side of the core. The stabilizer is built on the plan using the materials listed. The elevator halves are joined by a U-shaped piece of piano wire with a

metal elevator control horn silver-soldered in the middle. I used a pull/pull rudder-control system.

COVERING AND FINISH

The front of the cowl is shaped from a balsa block; I made the cowl top, bottom and side panels from litho-plate material. Small screws hold the plates in place. I covered most of the airframe with heat-shrink fabric, but I used tissue on the fuselage sides, wing fairings and the planked area in front of the cockpit. The tank portion was covered in thin litho-plate.





I covered most of the model with a heat-shrink fabric that I painted with car paint. Note the rib stitching; it adds a nice scale touch.

I really liked the yellow and silver paint scheme and decided to paint my model with car paint. I applied the silver first, followed by the yellow. The only difficult part was masking the scallops on the rudder. Using low-tack masking film, the task was easier than I expected. I cut the lettering from trim film, but it could also be masked off and painted. I fuelproofed the model with a two-part clear coat.

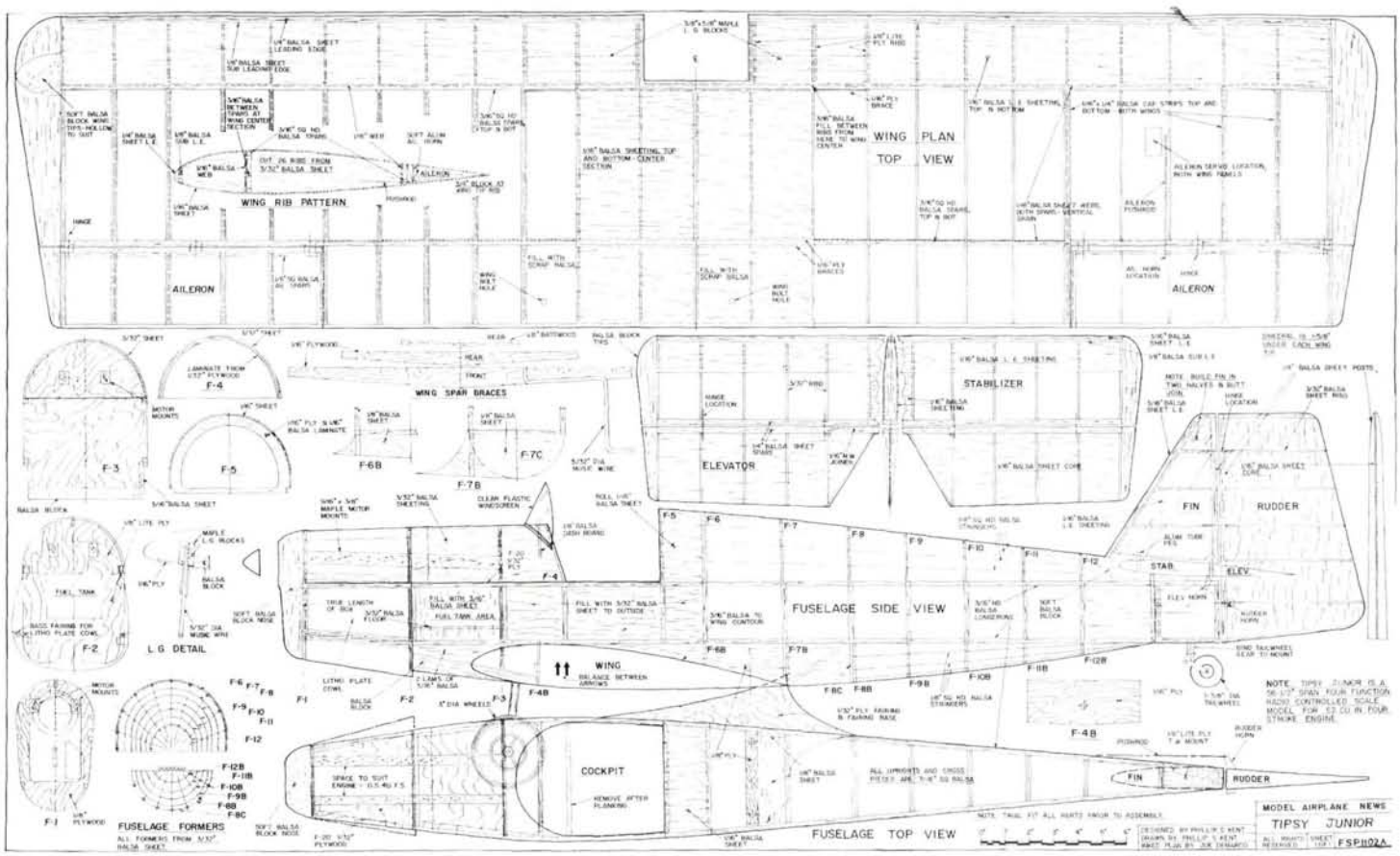
If you're looking for a model that has character and some aerobatic ability, then the Tipsy Junior is what you've been waiting for. It's easy to build and is a great scale subject for someone who wants to tackle a first-time scratch-building project. Powered by a .50-size 4-stroke engine, the Tipsy's performance is very realistic. What more could you ask for? ✈

Laser; *distributed by Proctor Enterprises (503) 678-1300; proctor-enterprises.com.*

Tipsy Junior

FSP1102A

Designed by Phillip Kent, the Tipsy Junior is a scale model that uses traditional balsa and plywood construction. It's easy to build and fly and can perform mild aerobatics. WS: 56.5 in.; power: .50 4-stroke; radio: 4-channel; 1 sheet; LD 2. $19.95



To order the full-size plan, turn to "RC Store.com" on page 150.

by Bill Jensen

RCV90-SP:
RCV's newest rotating-cylinder-valve 4-stroker

Manufactured in England by RCV Engines Ltd., the RCV90-SP is available in the U.S. at all major hobby retailers. The RCV60 was the first engine to be released in the U.S. (in 1997), and the 1.20-size engine followed in 1999. The "SP" denotes the latest version of the engine to incorporate refinements that increase power and performance. All three versions of the engine now carry the "-SP" designation.

These engines have an unusual mechanical arrangement. RCV stands for rotary cylinder valve, and it is this feature that sets RCV engines apart from all the others. RCV engines use a rotary valve built into their rotating cylinder to replace all the valve-train parts usually associated with 4-stroke engine operation; this eliminates about 30 internal parts. Fewer parts mean lower manufacturing costs and increased reliability. Of special interest is that the reciprocating nature of valve-train components (poppet valves, rocker arms, pushrods, lifters, springs, etc.) is what usually limits the rpm of conventional 4-stroke engine designs. Theoretically, the RCV concept eliminates this limitation!

Starting the engine by the behind-the-prop crankshaft socket, using the optional starter adapter available from RCV. I found it easy and convenient to use. Starts were instant. Hand clearance is adequate with reasonable care.

The optional starter adapter shown installed on a standard electric starter.

DESIGN

The propeller shaft is attached to the rotating cylinder; a port machined in between it and the cylinder aligns alternately with the intake, exhaust and glow plug at the correct times during the power cycles. Neat! Because of the 2:1 gearing ratio, this cylinder port revolves at half the crankshaft speed (as does the cam in a conventional 4-stroke engine). The large gear is machined into the cylinder base, and the small gear is attached to the crankshaft. The rotating cylinder drives the prop, and the crankshaft that drives the cylinder is powered by the piston! I can only imagine how many dinner napkins these guys must have gone through when they dreamed up this concept!

When you turn the prop by hand, these engines do not "feel" like your typical 4-stroke. First, because the gears are designed to have zero lash at operating temperature, you can feel each gear tooth strongly when the engine is cold, but when the engine has just shut down and is still warm, the gears feel smooth. Also, because of the gear ratio, the piston goes through two up-and-down cycles (two crankshaft rotations) for every propeller revolution, so you feel compression on every prop rev—not on every other rev, as with a conventional 4-stroker.

PROPELLER SELECTION

Because of the 2:1 crankshaft-to-prop gear ratio, all RCV engines have a propeller rpm that is half that of a conventional 4-stroke. For the RCV90-SP, the only suggested prop is the APC 18x12, but the company also lists other sizes on its website. (See the prop chart.) The engine must be loaded with a prop having approximately twice the pitch you would normally use. For comparison, a 14x6 is a popular prop size for the Saito .91. Though most of the recommended props are made by APC, you can, of course, use other brands, as long as the full-throttle static prop rpm remain in the 5,000 to 6,000 range. This gives a crankshaft rpm of 10,000 to 12,000. I like APC props for their efficiency and low noise and because they are of composite (nylon resin and fiberglass) construction. Since they're heavier than wood, composite props allow a lower idle than wooden props, and they are my personal choice. On the other hand, wooden props are lighter and accelerate faster. For this particular engine, any prop that loads the engine in the proper rpm range is a potential choice, with preference given to the composites for their flywheel effect.

ENGINE COMPARISONS

It isn't possible to directly compare the power of RCV engines with non-geared 4-strokes by simply checking the max rpm of the test engines with the same prop, so at the very least, I wanted to compare horsepower-rating claims. The Saito and O.S. .91-size 4-strokes

Left: a close-up view of the behind-the-prop starter socket. Right: the carb on the 90-SP is typical of all RCV engines and operates like any other carb. It has a high- and a low-end adjustment.

are said to have about 1.6bhp. The RCV guide suggests the same horsepower for the 90-SP, and it also says that an RCV engine is equivalent to any conventional 4-stroke of the same displacement. I emailed the RCV engineering department for clarification and was told that recent tests and calculations showed that the 90-SP had from 1.6 to 1.7bhp, in the range of 5,400 to 5,600 rpm, and this puts it in the same ballpark as its conventional peers. The RCV90-SP is somewhat heavier—about 5½ ounces—than an O.S. 91. Dimensionally speaking, the RCV is, of course, the clear winner in the height department, while its firewall-to-back-of-prop distance is about the same as the others'.

APPLICATIONS

A .90-size engine swinging an 18-inch prop? What type of model would be a good match? Actually, any plane that calls for a .60 to .90 2-stroke or a .80 to 1.20 4-stroke would be a good choice for the 90-SP. More specifically, several classes of plane may be ideal applications. Any large, slow, scale plane would be ideal, since an 18-inch prop is the correct size for many ¼-scale civilian light planes such as Piper Cubs, Aeronca Champs, Taylorcrafts, Stinsons, etc. Another suitable class of plane is ½-scale warbirds; the Top Flite Gold Edition kit series of traditional .60-plus-size models, including the P-51 Mustang, F4U Corsair, AT-6 Texan and Spitfire, to name a few. The Hangar 9 PT-19 and the new P-51D ARF are also good candidates.

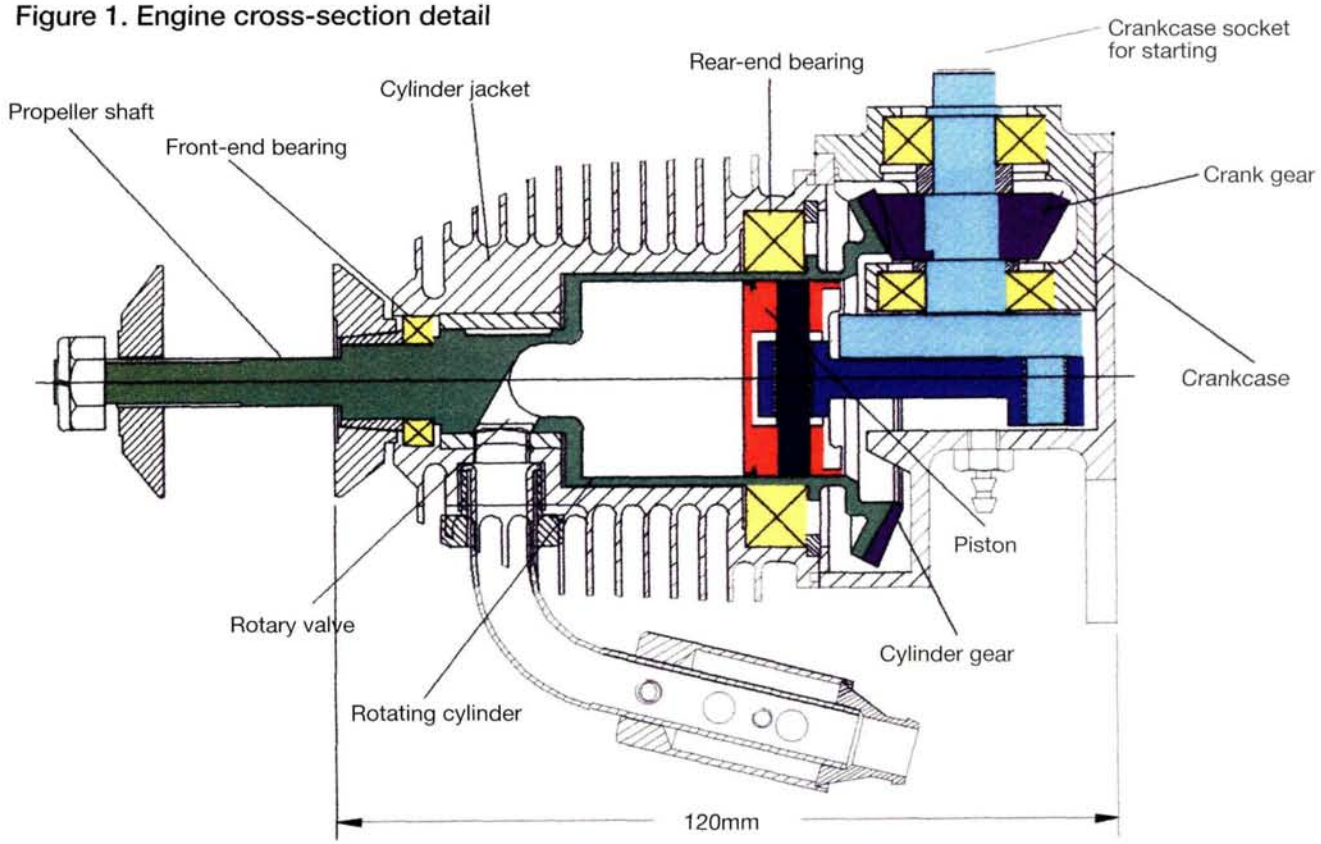
Any .60-size 2-stroke to 1.20 4-stroke-size "Stick" model, with simple, rugged construction and no cowl would also do well powered by the 90-SP. These would certainly be a good way to show off this high-tech mill; just be ready for all the extra attention at the field! For any of the aforementioned planes with a minimum prop-to-ground clearance problem or for scale fidelity, you have the option of using a smaller-diameter 3- or 4-blade prop in place of the 18-inch 2-blade.

ENGINE MOUNTING

The excellent owner's guide gives detailed engine-mounting instructions. The engine comes with a mounting plate that is used behind the firewall. It contains four blind nuts permanently swaged into the plate to accept the engine-mounting bolts. I found this plate to be helpful in laying out the hole pattern on my test stand. The guide also makes a special point of mentioning that a strong firewall is needed to resist the substantial torque forces generated when turning a large prop.

You can position the engine's rear section (containing the starter socket) in any of four rotational positions. The front half of the engine, retained by four bolts in a square pattern, allows the exhaust pipe and carb to be rotated as desired relative to the starter socket and airframe. This feature is particularly helpful in a scale model setup.

Figure 1. Engine cross-section detail



FUEL REQUIREMENTS

The owner's guide calls for the use of fuel containing 10-percent nitro and with a minimum oil content of 15 percent. Of the total oil content, no more than 6 percent should be castor. No special break-in fuel is specified.

During my test runs, I used a variety of fuels ranging from 5- to 30-percent nitro and found the engine was not sensitive to various blends and brands; it responded as would any conventional 4-stroke engine. More nitro generally produced more power but also a higher consumption rate. Fuel consumption appeared to be average for the displacement.

BREAK-IN

Following the guide, I ran the engine on the test stand for about one hour, in 15-minute increments, with ample cool-down periods between runs. The lowest idle rpm was about 1,600 without glow power; the range quoted in the guide was 1,200 to 1,500. Shooting for the 1,200 mark, I ran the engine for another hour. This produced an idle of 1,200rpm (1,100 with glow power), so I think the idle will continue to improve with more run time. For break-in and prop rpm tests, I used the recommended APC 18x12 prop and Wildcat 15-percent nitro fuel with 16-percent total oil (20 percent of which is castor and 80 percent is synthetic).

ENGINE STARTING

There are a few differences compared with traditional engines—and a couple of new things to learn—but complete retraining will not be required to operate this engine successfully! Any previous engine experience will serve you well. The owner's guide is well done, and reading it will provide all the knowledge required.

Since the engine has a built-in 2:1 prop-shaft reduction, the least obvious difference is that it should be started using the crankshaft socket that's behind the prop, near the rear of the engine! The socket provides instant starts with a standard starter, and it's safer, too. You can start the engine by cranking the prop if you have a high-torque starter, but this is discouraged by RCV.

To use the rear-starting feature, an optional starter adapter is available from RCV that can be attached to your starter. The adapter is simply a 5mm hex shaft mounted in a machined hub that fits on your starter's output shaft and is retained by setscrews. I converted an extra starter and have dedicated its use to the RCV engine, rather than switch back and forth. Though this starting method is out of the ordinary, it becomes natural, easy and positive after the first few engine starts.

SPECIFICATIONS

ENGINE: RCV90-SP
MANUFACTURER: RCV Engines Ltd.
DISPLACEMENT: 0.9ci (15cc)
WEIGHT: 28.6 oz. (without muffler)
LENGTH: 4.73 in. (120mm)
PROP-SHAFT DIAMETER: 5/16 in.
RPM RANGE: 1,200 to 6,000
MAX. BHP: 1.6
OUTPUT: 2:1 prop-shaft reduction
RECOMMENDED FUEL: 10-percent nitro with 15-percent oil (containing 6-percent castor)
PRICE: $319; starting adapter, $9.95

COMMENTS: the RCV90-SP is the third in a line of unique rotating-cylinder-valve engines, and it produces a great amount of torque compared with 4-stroke engines of similar size. The engine operates on a 4-stroke principle but has far fewer parts for greater overall reliability. Because the prop shaft has a 2:1 gear reduction, the engine requires larger than normal props with roughly twice the pitch of normal props. The engine is equipped with RCV's exclusive behind-the-prop starting socket for increased safety and instant starting performance.

HITS

- High torque allows use of large, scale-like props, including those with three and four blades.
- Fits inside tight scale cowls.
- Behind-the-prop starting option (a safety factor).
- Well-done owner's guide and good tech support.

MISSES

- Audible gear noise.

RECOMMENDED PROP SIZES

PROP	SIZES
2-blade	16x14, 17x13, 18x12
3-blade	15.75x13
4-blade	15.5x11

PROP TESTS

Prop/ size	Max rpm	Best idle (w/out glow)	Best idle (w/glow)
APC			
18x12	5,700	1,300	1,200
17x13	5,800	1,400	1,300
16x16	5,400	1,400	1,300
15x14	5,700	1,500	1,400
Dynathrust			
18x8	5,800	1,200	1,100

OPERATION

Carburetor adjusting is similar to adjusting other 4-strokes and is covered well in the manual; however, I discovered a shortcut to getting the lowest reliable idle. After you set the high-speed needle, set the idle-mixture needle lean enough so there is no drop in rpm when you remove the glow power. Then richen (turn counterclockwise) the idle needle one full turn. The engine sound is quite different, with the gear noise about as strong as the muffled exhaust noise. It's a little like a hovering RC helicopter with its blend of gear whine, blade whir and engine-exhaust pulse. The gear whine is high-pitched compared with the exhaust note; it could be compared with a turbocharged engine! It covers up some of that 4-stroke, Harley-like putta-putt-putt sound! I expected the engine to be especially smooth-running because of its unique design, but vibration seemed about average for an engine of this size. This casual observation may be related to my prop selections more than the engine, however.

OWNER'S MANUAL AND WEBSITE

The included owner's guide is very well done and includes sections on basic do's and don'ts, as well as plug, fuel and prop selection, starting, breaking in, installation, care and maintenance, product guarantee and tech support. The RCV website, rcvengines.com, also has a wealth of useful information. You'll find info on its entire engine line including a prop selection chart, general specifications, dimensional diagrams, parts list with exploded views, prices and sales information. RCV offers a 2-year warranty covering manufacturing and workmanship defects. For a list of U.S. and worldwide distributors, see the RCV website.

CONCLUSIONS

The RCV offers big-prop capability, small frontal area and has no valve train to maintain. The cost is a slightly heavier engine and increased noise. I was impressed with RCV's owner's guide, online information and support. The price is competitive with other 4-stroke engines, and the engine is extremely interesting in its function and design.

APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.
Great Planes Model Distributors Co. (800) 637-7660; greatplanes.com.
Hangar 9; distributed by Horizon Hobby.
Horizon Hobby Distributors (800) 338-4639; horizonhobby.com.
O.S.; distributed by Great Planes; osengines.com.
RCV Engines Ltd.; rcvengines.com.
Saito; distributed by Horizon Hobby.
Top Flite; distributed by Great Planes.

Masking secrets revealed!

In this month's column, I will discuss the all-important masking process required for painting scale models. Proper masking is vital for a good paint job and greatly enhances your model's appearance.

There are two basic ways to mask your model. Positive masking is when you first apply the color of your marking and then mask that area to protect it when you paint on the rest of the model's finish. When the masking material is removed, the initial color is once again visible. Negative masking is when you apply the mask after the base color has been applied to the model and then spray the area within the masked field. This protects the rest of the model as you spray on the marking. Positive masking is generally used when a light-colored logo or marking must be applied to a darker background. Negative masking works best for spraying dark-colored markings onto a lighter background.

The author's Hawker Fury biplane was painted using the masking techniques explained in this month's column. Impressive results!

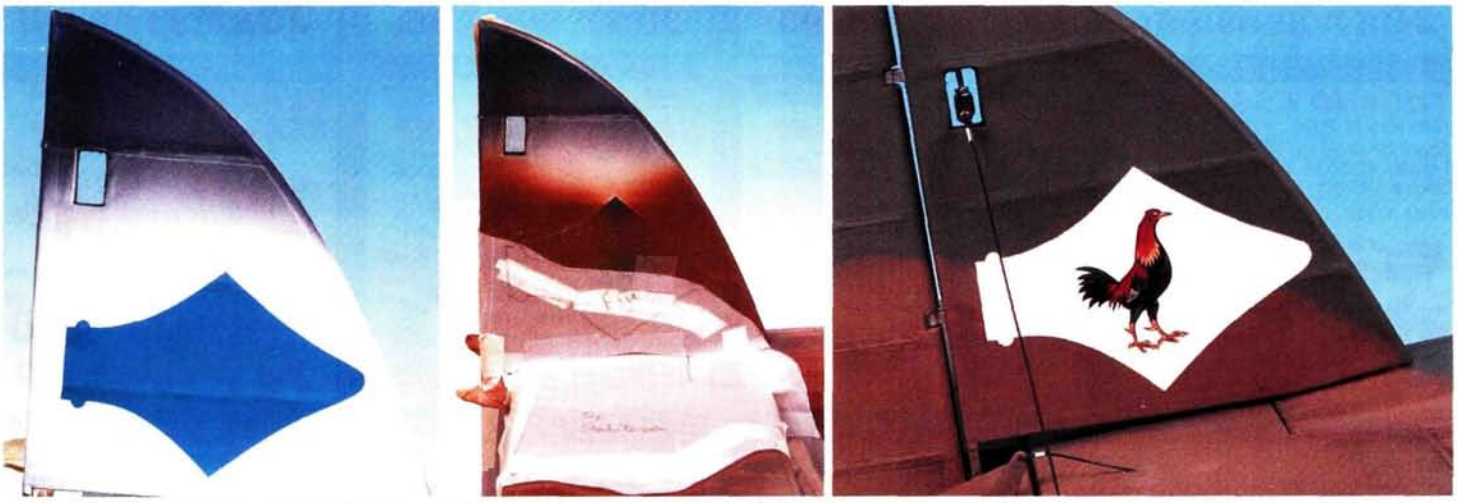
MASKING MATERIALS

A popular masking material (available at art supply stores) is artist's masking film, often referred to as "frisket," that is made of either thin plastic or paper and has a low-tack adhesive backing. Disadvantages of using frisket paper, however, are that some brands aren't compatible with the 2-part paints used to finish models, and it is somewhat expensive. Another source for masking material is your local auto-body shop. An acceptable alternative is good old-fashioned masking tape and the well-known 3M or Scotch-brand Magic Tape used in many offices. Another great product that takes the hassle out of painstaking masking jobs on curved surfaces is Bob Dively Models' Masking Liquid. This milk-like substance can be brushed or sprayed onto just about any material. Once it has dried, you can simply draw your markings on it and cut out the areas you want to paint.

Before I spray-paint a model, I feel it is necessary to mask each and every part onto which I don't want paint to be applied; without masking, spray mist (over-spray) always gets into all those little corners, nooks and crannies. Every opening, regardless of its size, should be covered. Don't use newspapers for this job; newsprint ink will be transferred from the paper and leave a mirror image of *The New York Times* on your model! Brown wrapping paper is a better choice.

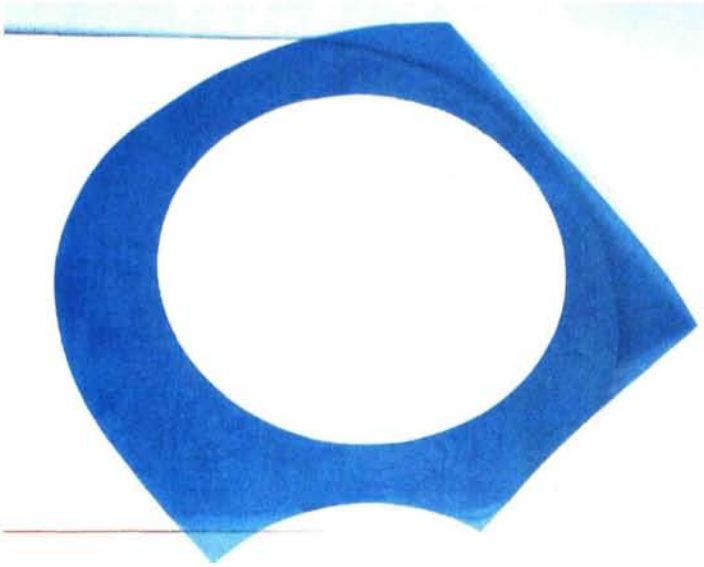
MASKING CURVED SURFACES

Painting straight lines on a wing and other curved surfaces requires extra attention. By just applying a long strip of masking tape, it is nearly impossible to produce a straight line across a curved surface. The tape tends to follow the wing's shape, which, of course, is anything but straight. To produce perfectly straight lines, I use a 4-foot-long steel ruler as a guide, and with a soft pencil I mark the line's position with small dots. I then apply the tape along this path. For straight lines on smaller curved parts, such as an engine cowl, I use a thin thread or stretched wire between two outer points as a reference guide. Be sure not to let the wire touch the surface; it may not remain in a straight line.

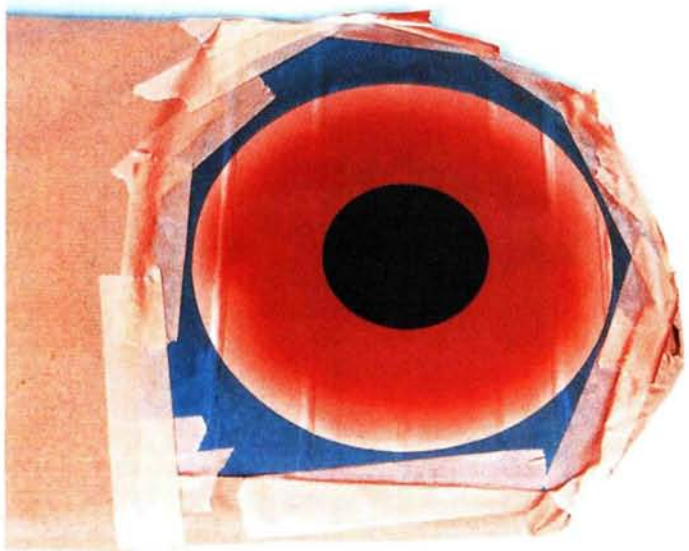


Left: the badge marking on the Fury's tail was painted using positive masking. First the fin was painted white in the area where the badge would ultimately be. Here you see the fin with the masking material in place covering the white paint. Center: here, the fin is being painted with a camouflage paint pattern. Notice the raised pattern mask applied to the fin and stabilizer. Right: the completed fin badge. Note the sharp edges of the tail marking. The rooster is a decal applied to the white badge.

To paint the roundel onto the white wing panel, I first positioned the entire mask where I wanted it. Note that all the parts are taped together so I can move them as one piece.



I then removed the inner two circle masks and sprayed the red paint into the center of the field.

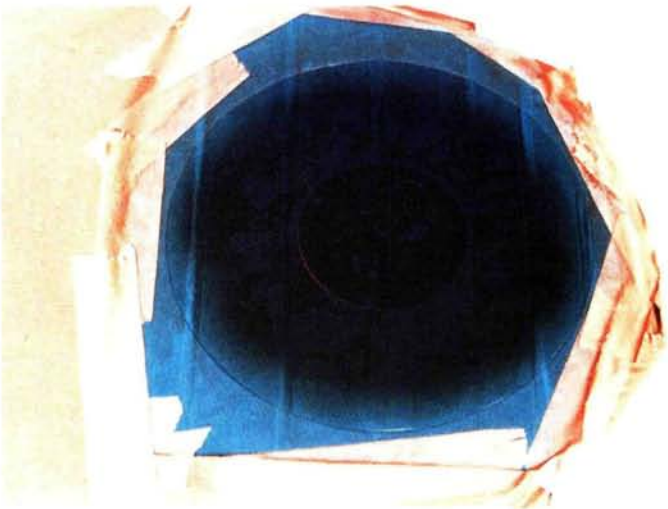


Once the paint had dried, I placed the masks back into place and then removed the outer circle; this leaves the inner circle mask in the proper location.

ROUNDELS

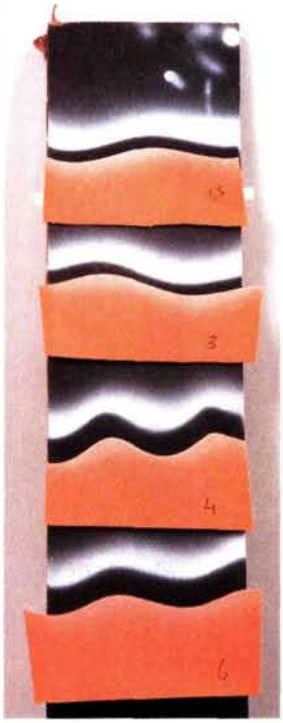
To paint roundels, I use multi-part masks that I make from good-quality masking film. The secret to properly using multi-part masks is to hold the various parts together to prevent distortion. I take a piece of fiberboard plate and cover it with double-sided tape; any brand will do. I leave the protective wax paper on the upper exposed side, then I cut out the various parts of the masks. I peel off the film's protective backing and stick the pieces to the fiberboard. The frisket sticks to the wax paper, but it's easy to remove again. I cut the masks with an Olfa compass cutter that's available at any office-supply store or craft shop. I also cut out the roundels in pairs; this way, they always look the same. As it is virtually impossible to lift off a cut mask without its distorting, I hold all the parts of the mask together by applying cheap, low-tack paper masking tape. In this way, it's easy to remove and replace the various parts of the masks before and after I apply them to the model. My Fury Hawker shown in the photos has a half black/half white undersurface paint scheme, so the masking for each side is slightly different. Here's a brief explanation of how I did it.

For the white portion of the wing, I first sprayed the wing surface white and then put on the entire mask to ensure the roundel's correct position. After masking the rest of the wing (plastic garbage bags work great here), I removed the two inner circles (still taped to each other), and I then sprayed the red area of the innermost circle. I applied only as much paint to cover just the very center of the roundel; spraying the entire exposed area would have built up an unwanted paint ridge. Once the paint had fully dried, I replaced both masks and removed the outer circle. Doing this accu-



To finish the roundel, I sprayed on the blue color.

With all the masking pieces removed, you can see the crisp color separation lines. Using the multi-part mask technique makes it easy to keep all the painted areas in proper registration with one another.



Left: using an airbrush alone to reproduce the camouflage pattern would have produced too soft a color separation line. Here, I have just removed a portion of the raised-pattern mask from the Fury's fuselage. The effect is just right! Right: this is my test strip for adjusting the height of my raised-pattern mask. As you can see, the higher the pattern is raised off the surface, the softer the painted pattern becomes.

rately repositions the inner circle. I then sprayed the second color (blue), and after it had dried, I removed the rest of the masking.

For the black half of the wing, I protected the entire roundel with a one-piece mask. I then sprayed the wing black. Once the paint had dried, I removed the mask and then used the same masking method as I had used for the white wing panel.

CAMOUFLAGE SPRAY OVERLAP

When you apply a camouflage paint scheme, the colors must overlap each other in a scale fashion. Often, depending on your scale subject, these color demarcation lines have to be quite sharp but not as sharp as would be produced by just using masking film or tape. Using only an airbrush to spray the pattern on a model will produce too soft a line. To achieve good results, I use a raised template mask. Raising the pattern slightly creates a very small over-spray, and that softens the line just enough for a scale appearance. But how much should you raise the pattern to produce the line sharpness you want? I make test strips using cardboard set at different heights above the surface, and I spray over the edges at a 90-degree angle to see what the results will be. As you can see in the photographs, the lines differ clearly; raising the pattern as little as 1/16 inch affects the spray pattern. You can raise the pattern as much as 1/4 inch, but the correct distance can be determined only by experimentation.

That's it for this month. Try these techniques and see how they work. Don't be afraid to try your own masking techniques as well; just test them first before you commit the paint to your model.

Bob Dively Models (216) 953-9254.

Carving wingtips made easy

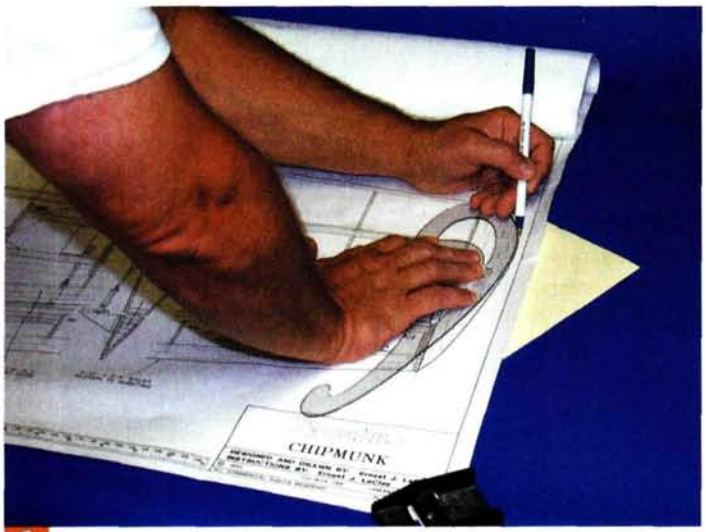
14 simple steps to shape up

by Rick Bell

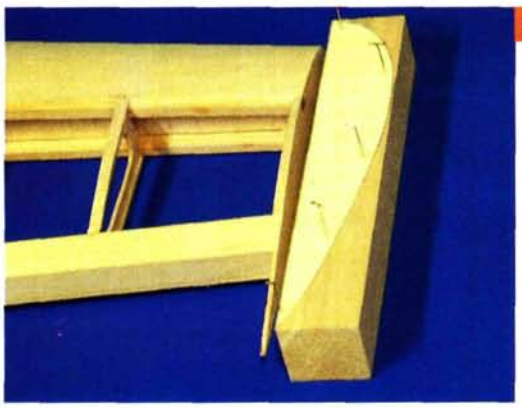
I really enjoy building airplanes from kits. To be able to create a flying model from a box of balsa sticks, sheets and blocks gives me a lot of satisfaction. Part of that enjoyment comes from carving those balsa blocks to a required size and shape.

A lot of kits use a rectangular block of balsa for the wingtips that you must carve and sand to its final shape. Carving a wingtip is easy and, to me, a lot of fun. You only need a few basic tools to produce expert results.

For this article, I used a Dynaflite Chipmunk, which has a relatively simple wingtip shape, but this technique can be used to produce just about any shape of wingtip that you want. Here's how I do it.



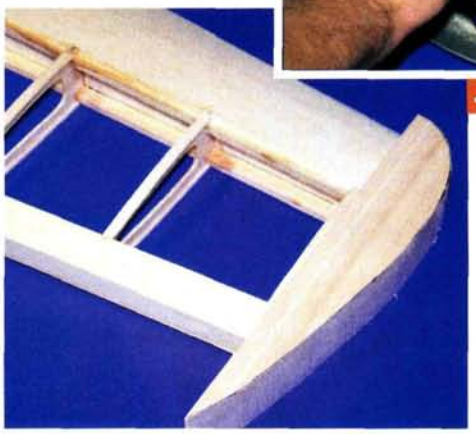
1 I don't like to cut up my plan, so I use a French curve and carbon paper to trace the wingtip shape onto a manila folder, and then I cut the pattern out. You could alternatively use a copier to make a copy of the wingtip. After you've cut out the pattern, check it against the plan for accuracy.



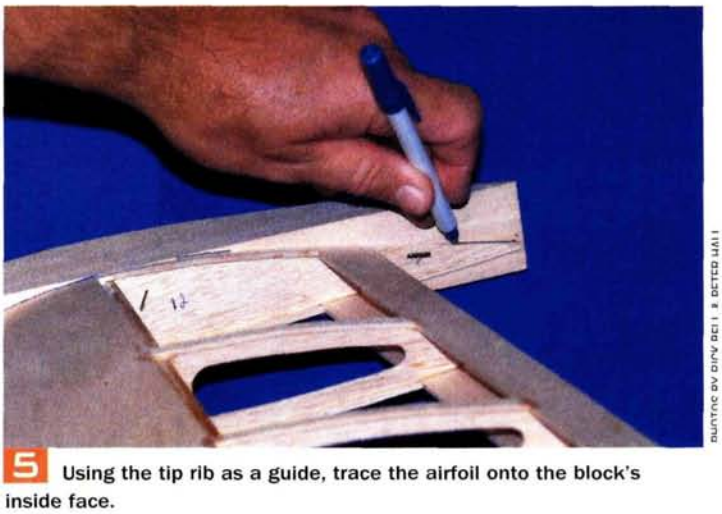
2 Pin the pattern onto the tip block and draw the tip's outline on the block with your pen or pencil. Don't use a felt-tip pen; the ink tends to bleed.

Before you start, assemble the tools and materials you'll need: a manila folder (to draw the wingtip pattern on), a French curve, aliphatic-resin and thick CA to glue the balsa block to the wing, a flexible ruler, a razor plane, a sanding bar, sandpaper in a variety of grits and a ballpoint pen or a pencil.

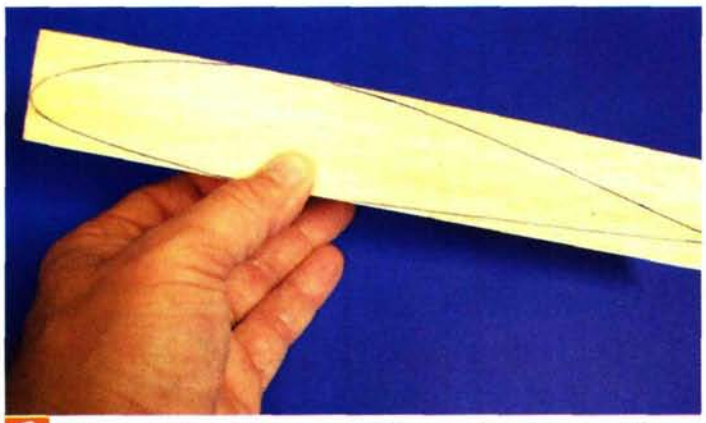
3 Use a jigsaw or a band saw to cut the block just outside of the line; you want to leave a little wood so you'll be able to sand the block to the proper shape later. If you don't have a jigsaw or a bandsaw, use a razor saw, but take your time and remove only small pieces at a time.



4 Using the pattern as a guide, sand to the line to smooth the wingtip. Be sure to sand it so that the outline is flat. Now pin the tip block to the wing so that it completely covers the tip rib.

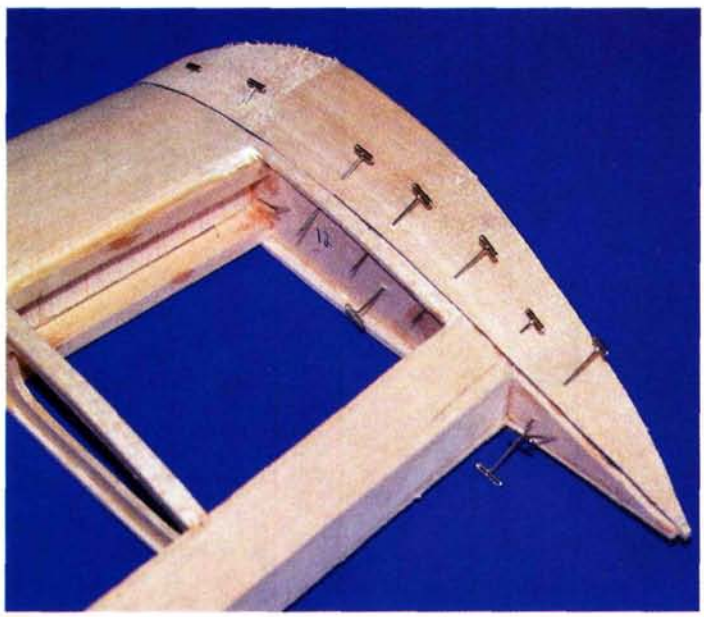


5 Using the tip rib as a guide, trace the airfoil onto the block's inside face.



6 Be sure to draw the entire airfoil. If you make a mistake, lightly sand the block to remove the outline and draw it again.

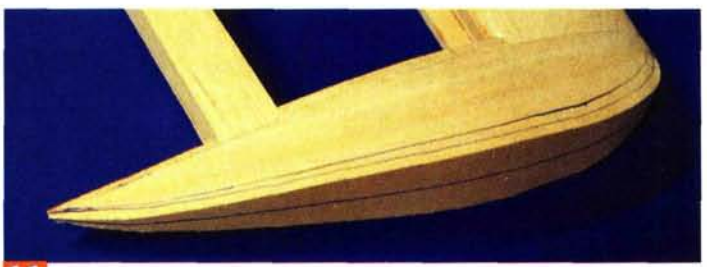
7 Cut just to the outside of the airfoil shape line. When you've finished cutting, your block should have both the plan view and the airfoil cut into it.



8 Glue the block to the tip rib and use pins to securely hold it while the glue sets. I use thick CA in the center of the block and aliphatic resin on the block's outer edge. When you pin the block to the wing, the excess glue will ooze out, and if you use CA around the edges, it will harden the balsa and make it very difficult to sand. The aliphatic resin is a lot easier to sand, and you'll end up with a smoother job. Allow the glue to cure thoroughly before you proceed to the next step.

9 Before you start to shape the block, trim it so that it conforms to the wing's taper (thickness) and airfoil shape. Use a razor plane and sanding bar to remove wood from the top and bottom of the block, and sand it smooth. Use the wing as a guide and work slowly, removing only a little wood at a time. Check your progress often. Don't sand the wing; sand only the block, or you'll risk altering the airfoil's shape. The tip block should be flush with the tip rib and should continue the wing's taper.

10 To keep the block symmetrical while you shape it, draw reference lines to guide you. Determine the midpoints along the thickness of the block in several places, and mark these points. Using a flexible ruler, join the marks you made and draw a centerline from front to rear.

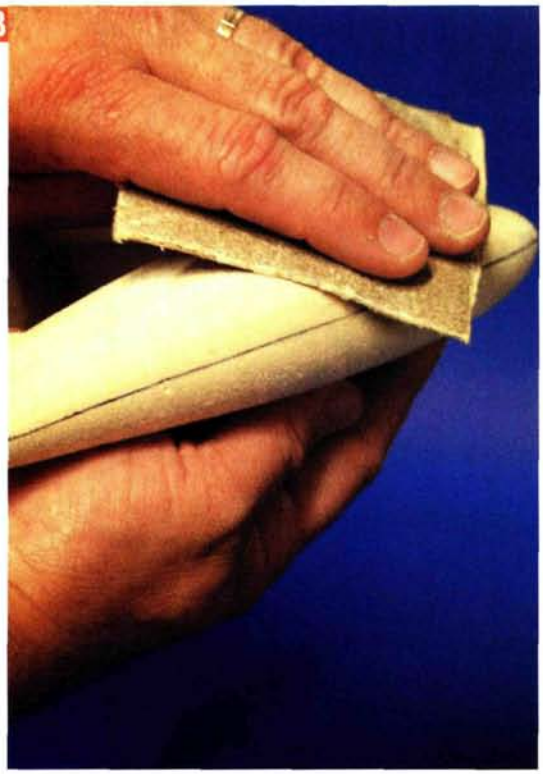


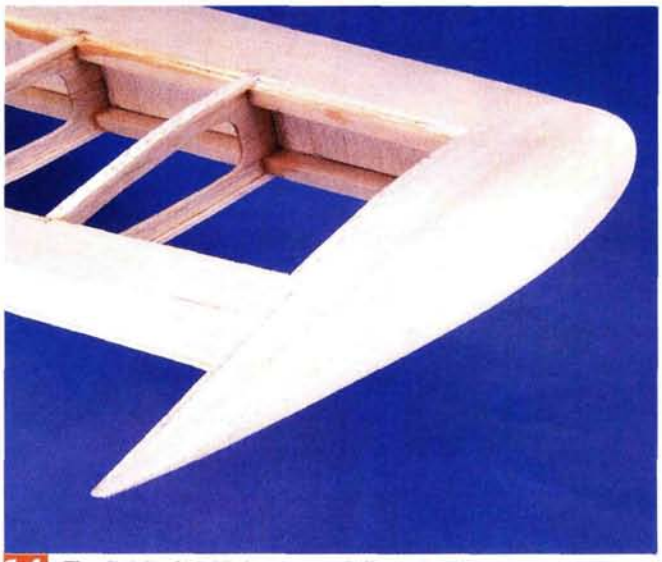
11 Use your tip pattern to draw reference lines on the top and bottom of the tip. You'll use these lines as guides when you carve the tip.

12 Use a razor plane (Master Airscrew's razor plane works very well) to shave the balsa off the corners of the tip. If you don't have a razor plane, use a sharp razor blade or hobby knife. Work slowly, and shave off only a little at a time, being careful not to gouge the wood. Continue to shave off wood to achieve the general shape of the tip. Don't remove too much wood at one time; you can always go back and remove more if necessary.

Start with 100-grit sandpaper and sand away the ridges left by the razor plane. Continually "eyeball" the tip for symmetry as you sand. Once you have shaped the tip to size, sand it with progressively finer grits of sandpaper until it is smooth as silk.

13





14 The finished tip! It has smooth lines that blend gracefully into the end rib. Rest assured, when your flying buddies see your finished wingtips, they'll think you spent many hours carving and sanding. Don't tell them that it took only a little effort and forethought to produce these excellent results.

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Hangar 9

Micro Digital Tachometer

A pocket-sized engine-tuning tool!

The progress of technology is amazing to watch. Our hobby provides an excellent venue from which to view this progress, and we constantly reap the benefits of product evolution. I am always intrigued by how things get smaller and better as time goes by. Take the invaluable engine tachometer; many years ago, my first tach was a mechanical unit with a protruding cupped wand that you had to place on the model's spinner! I hoped it wouldn't slip off when I attempted to hold it centered on the spinner's nose! As the dial-indicator needle settled on a reading value, its accuracy was said to be within 100 revs! Crude by today's standards? Sure, but hey; this was high tech for the day.

Next came the tachometers with red LED readouts, followed quickly by the big breakthrough of photocell input to read the prop revs. Boy, we were cooking with gas then! We've enjoyed dramatic increases in accuracy and convenience as tachometers have become smaller. Oh, yeah; tachometers are not only better, they're less expensive, too! What a world we live in!

The newest rev-counting marvel to hit the market is Hangar 9's Micro Digital Tachometer. As the name implies, it's small; it fits nicely in your shirt pocket. Powered by a single 3V, 220mAh lithium battery (included with the unit), the Micro Digital Tach has an LCD 4-digit display that can register up to 32,000rpm. The reading on the screen has to be multiplied by 10 to give the actual rpm value.

There's just one button. Press it once to turn the unit on; a small icon indicates that the setting is for 2-blade propellers. Press the button again, and the icon switches to the 3-blade setting; press it again, and the 4-blade setting appears. Press the button one last time, and the tach switches off! Best of all, if you leave the unit on for an extended period, it will automatically shut itself off to save battery power! It's so easy that even the absentminded professors among us won't get into trouble!

Checking the unit's accuracy was a piece of cake; I simply turned it on and pointed it toward the fluorescent light in my workshop. It registered 360. This type of light operates at a standard 60 cycles (60 pulses per second). That's 60x60, which equals 3,600 pulses per minute. When you point the tach toward sunlight, the unit registers 0. For safety's sake, always take your engine rpm readings from behind the propeller.

All this accuracy must be expensive, right? Wrong! The Hangar 9 Micro Digital Tachometer costs only $27.99, and that includes the lithium battery. If you want to replace your old worn-out tachometer, give this little gem a try; it's the latest development in a long line of convenient devices that make our hobby so much fun! That it's also a great value is just the icing on the cake! —*Gerry Yarrish*

Hangar 9; distributed by Horizon Hobby (217) 355-9511; horizonhobby.com.

T-Tech Corp.

Swivel e Mount

A new solution to an old problem

Flight-trimming a model to fly straight and true can be an arduous task, as there are many factors that influence the way the plane flies. Changes to the wing and stabilizer incidence, center of gravity and engine thrust all have dramatic effects on the plane. When making trim changes, most modelers don't bother with the engine thrust because it entails removal of the engine.

But what if you could make thrust changes to your engine quickly and easily just by using an Allen wrench, even if the engine is enclosed in a cowl? I bet more modelers would fine-tune this neglected area. Well, T-Tech Corp. has just the ticket: the Swivel e Mount. This unique engine mount allows you to easily make thrust/offset adjustments with just an Allen wrench, even if the engine has a cowl around it. How does it work? The Swivel e Mount is made of precision CNC-machined aluminum alloys and consists of a round backplate (a socket) that has a shallow cup cut into it. The mount (a ball) has a matching face that mates to the socket. The two parts are tied together with a ball washer (two wedge-shaped washers that use a wedge bolt and a flanged sleeve that passes through the entire assembly). A hefty retainer bolt threads into the sleeve and locks the assembly together.

The unique ball-and-socket design allows 360-degree axial rotation. This means the engine remains centered on its own axis (the engine-thrust washer stays in the middle of the cowl cutout) while allowing offset and side-thrust adjustments of up to 4 degrees in any direction. No engine removal, shimming, or relocating of the engine mount is ever needed. Just loosen the wedge bolt with an Allen wrench, make the required adjustment, and retighten the bolt. It's that simple! For maximum security, the two wedge-shaped washers compress each other when tightened by the wedge bolt—a very clever design. The Swivel e Mount is available in several sizes for engines ranging from .60 to 1.80; mounts for gas engines are also available. The mounts come complete with instructions and hardware. When you try one, you'll wonder why no one thought of this sooner. Prices start at $107.25 —*Rick Bell*

T-Tech Corp. (610) 823-6141; t-tech-corp.com.

Slimline Mfg.

Pitts-style inverted muffler

Hide that muffler!

Slimline has long been the premier manufacturer of mufflers for our models. Whether you needed a side-mounted, inverted, or other specialty muffler for a 2-stroke, 4-stroke, or gas engine, chances were pretty good that Slimline had you covered. But if you needed a Pitts-style inverted muffler for the big Saito 1.50 or 1.80 4-stroke, you were out of luck—until now. Only 4 inches wide (4½ inches with smoke adapter) and 1 3/16 inches in diameter, the newest Slimline muffler is made of cast aluminum with an internal baffle and welded-on, twin exhaust stacks. To ensure a leak-proof seal, the muffler comes with a precision-machined mounting stub that has a groove cut into it for a high-temperature O-ring. The CNC-machined mounting flange fits between the stub and the engine and holds the one-piece muffler in place for a perfect fit. A standoff is also welded on the muffler for an adjustable steel L bracket that is attached to the muffler and to the engine-mount lug; this ensures that the muffler won't work itself loose under vibration. The compact muffler's exhaust stacks are angled back and, depending on the engine installation, a small relief cut may be needed in the firewall. Installing the muffler is straightforward and requires no special tools—just a couple of Allen wrenches. It took me about 5 minutes to attach it to my Saito 1.50. This new muffler is available with a smoke adapter for $119 and without for $89.99. If you've been looking for a quick, easy and clean muffler installation for that big Saito, then the new Slimline Pitts-style inverted muffler is what you've been waiting for. *—Rick Bell*

Slimline Mfg. (480) 967-5053; slimlineproducts.com.

E-flite

Summit Charger

Charging made easy!

E-flite's Summit is a 12V, DC-powered charger that will peak-charge 4- to 7-cell Ni-Cd and NiMH battery packs. It has unique peak-detection circuitry that continuously monitors the battery's voltage charge curve and predicts when the peak will occur. This ensures that your batteries are fully charged every time, and it protects them from the dangers of overcharging. The Summit's negative pulse charge circuitry feature eliminates the memory buildup and voltage depression that is common in Ni-Cd batteries. The charging process also involves a high-frequency positive pulse followed by a high-current, short-duration discharge pulse. The combination of pulsed current charge and discharge conditions the cells, keeps the batteries in top-performing condition and helps to extend their life. After a battery has peaked, the Summit immediately switches to a pulse maintenance mode.

The Summit's power cord is equipped with banana plugs that can be attached to a power panel, but alligator clips are also provided if you choose to power the charger directly from a 12V battery. Three charge leads are also provided: one with a Tamiya connector for charging sub-C packs, one with a BEC connector for charging 6- to 7-cell slow-flyer packs, and one with a universal receiver connector for charging 4- to 5-cell receiver packs.

The Summit charger has infinitely variable charge rates from 250mA to 4500mA and is extremely easy to use. The faceplate contains an LED to indicate charge status, a knob to set the charge rate and a pushbutton to start the charge cycle. Once the charger is connected to a 12V power source, all you have to do is plug in the battery to be charged, set the desired charge rate and push the start button. You can't make it much easier than that!

The Summit is compact (5¼x4x2¼ inches), comes with a two-year warranty and sells for just $49.99. *—Jim Onorato*

E-flite; distributed by Horizon Hobby (800) 338-4639; horizonhobby.com.

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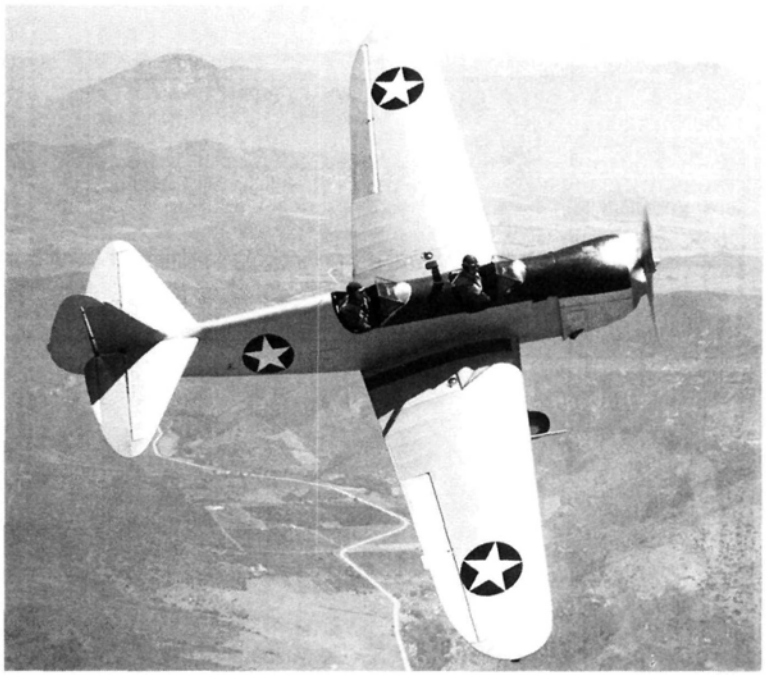
NAME THAT PLANE

Can you identify this aircraft?

SEND YOUR ANSWER to *Model Airplane News*, **Name that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.



Congratulations to C.E. Wolfe of Scottsdale, AZ, for correctly identifying September's mystery plane as the Commonwealth Wirraway, an Australian development of North American's general-purpose, two-seat monoplane known as the N.A. 33. In 1937, the Commonwealth Aircraft Corporation completed negotiations to acquire a manufacturing license from North American and took delivery of a single American-built N.A. 33 for submission to official test by the Royal Australian Air Force (RAAF). The prototype made its first flight in March of 1939 and the first Wirraway was delivered to the RAAF that July. A total of 755 had been built by the time production ended in 1946. Though originally intended to be a trainer, the Wirraway was widely used by the RAAF as an operational aircraft. Powered by an Australian-built 600hp Pratt & Whitney S1H1-G Wasp radial engine, the 43-foot-wingspan Wirraway could reach a maximum speed of 200mph. ✈

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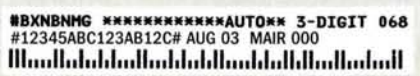

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BY JAIME LAGOR

Dreaming big

For many years, Merlyn Graves dreamed of building and flying an Avro Vulcan Bomber, and in 1987, he began to make that dream a reality. According to Merlyn, the resulting aircraft turned out to be the most challenging, but satisfying, aircraft that he would ever build.

Merlyn started by making a foam plug of the fuselage; he used his Byron F-15 as a model and an old issue of *Profile Publications* as a guide. But after he had cut all the pieces out of foam and spent a couple of weeks assembling them, Merlyn was forced to "temporarily" put the project aside.

It was 13 years before Merlyn was again able to turn his attention toward the Vulcan. Unfortunately, after he pulled all the pieces out of the closet and cleared away more than a decade's worth of dust, Merlyn discovered that he had incorrectly joined the halves, and that the whole project would have to be started again from scratch.

This photo of Merlyn alongside his lifelong dream shows just how immense the Vulcan really is.

The second time around, Merlyn thought it best to stick with his strength, so he decided to build his Vulcan Bomber from wood. With the help of AutoCAD and his increasingly fragile copy of *Profile Publications*, he generated a set of workable scale drawings; construction of the bomber began again in August 2000.

This is a close-up of two of the four fans that propel Merlyn's Vulcan to speeds greater than 100mph.

Merlyn's decision to power the model with four Dynamax ducted fans on O.S. .91DF engines forced him to deviate slightly from scale, as the size of the outboard fans simply did not match the rest of the model. But because he enjoyed stand-off-scale building, Merlyn didn't see that as much of a problem. He did, however, consider the immense size of the airframe a challenge. To ease the transportation and handling of a 136-inch-wingspan, 121-inch-long bomber, Merlyn designed it so that the vertical stab/rudder, the 36-inch nose and the wings outboard of the fans were all removable.

Because the four ducted fans occupied the majority of the fuselage/wing interior section, there wasn't any way to build a main spar into the wing as is typically done. To compensate, Merlyn had to design an airframe with enough strength and structural integrity for the fuselage section to accommodate the outboard wing loading.

Finding landing gear strong enough to accommodate such a large aircraft can sometimes be difficult, but it wasn't so for Merlyn. Some years ago, he had acquired a set of landing gear for a 144-inch B-25 that he intended to build. Although that aircraft never materialized, its intended landing gear surely came in handy on the Vulcan.

Merlyn followed all of the standard methods to calculate the center of gravity (CG), but because of the Vulcan's complexity and considering the time he had invested in the model, Merlyn wanted some reassurance that it was correct. His solution was to construct a 36-inch, electric-powered scale model of the Vulcan and fly it to determine the exact CG. He then applied that number to his giant-scale Vulcan and moved it forward approximately 2 inches. The method was a bit unorthodox, but it worked!

It took 1½ years for Merlyn to complete his Vulcan bomber. Although he had originally hoped to bring the weight in at around 65 pounds, the model weighs a whopping 90 pounds with fuel. It has a wing area of 5,700 square inches and a wing loading of 37 ounces per square foot!

Merlyn's Vulcan made its first flight at Joliet, IL, Regional Airport on May 10, 2002. According to Merlyn, his Vulcan accelerates like a hot-rod and easily reaches speeds well in excess of 100mph.

Subsequent flights revealed a few structural design problems that have since been corrected, and the engines also required quite a bit of work. Merlyn is still working on keeping all four of them running at once, but the Vulcan has flown on three, two and even one engine, proving to be quite stable and predictable in emergency situations.

All in all, Merlyn is quite pleased with his Vulcan bomber. Who wouldn't be? ✈